CONSEIL PERMANENT INTERNATIONAL POUR
L'EXPLORATION DE LA MER

RAPPORTS

ET

PROCÈS-VERBAUX DES RÉUNIONS

VOLUME LXXXI

PROCÈS-VERBAUX

(JUIN — 1932)

EN COMMISSION CHEZ
ANDR. FRED. HØST & FILS
COPENHAGUE

Prix: Kr. 9.00.

Décembre 1932

COPENHAGUE — IMPRIMERIE BIANCO LUNO A/S

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VINGT-CINQUIÈME RÉUNION
COPENHAGUE — JUIN 1932

BUREAU DU CONSEIL:

M. H. G. Maurice, Président du Conseil.
M. Otto Pettersson, Vice-Président du Conseil.
M. J. Hjort, Vice-Président du Conseil.
M. Théodore Tissier, Vice-Président du Conseil.
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M. le Dr. P. Jespersen, Strandvej 34 B, *Copenhague.*

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Experts: *M. le Capitaine de Frégate José Ma Roldan, Directeur General de Navigation et de Pêche Maritime.

*M. le Dr. Fernando de Buen, Chef de Biologie à l'Institut Espagnol d'Océanographie, *Madrid.*

*M. l'Amiral Léon Herrero, Directeur de l'Institut et Observatoire de la Marine, *San Fernando* (*Cadix*).

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* Empêché d'assister à la réunion.

M. l'Administrateur en Chef LACHAT, ancien Gouverneur par intérim des Iles Saint-Pierre et Miquelon, *Paris.*

M. G. BELLOC, Chef du Laboratoire de l'Office des Pêches à *La Rochelle.*

M. JEAN LE GALL, Professeur Agrégé de l'Université, Chef du Laboratoire de l'Office des Pêches à *Boulogne s/ Mer.*

M. le Dr. FAGE, Sous-Directeur de Laboratoire au Muséum d'Histoire Naturelle, *Paris.*

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Mr. H. WOOD, M. A., Fishery Board Laboratory, *Aberdeen.*

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Experts: M. le Professeur H. H. GRAN, Laboratoire Botanique, *Oslo.*

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Pays-Bas: M. le Dr. J. J. Tesch, Chef de la Section "Pêche maritime" de l'Institution Gouvernementale pour l'Examen Biologique des Poissons, Heerengracht 2, *'s Gravenhage.*

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Pologne: M. Michel Siedlecki, Professeur de Zoologie à l'Université de Cracovie, 6, St. Anne, *Cracovie.*

M. Joseph Borowik, Directeur de l'Institut Baltique, Franciszkanska 14, *Torun.*

Portugal: M. le Contre-Amiral Tito de Morais, Président de la Commission Centrale des Pêcheries du Ministère de la Marine, *Lisbonne.*

M. le Docteur Alfredo Ramalho, Aquario Vasco da Gama, *Dafundo (Lisbonne).*

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M. le Dr. K. A. Andersson, Directeur des Pêches Maritimes, Kungl. Lantbruksstyrelsen, *Stockholm.*

Experts: M. le Dr. Arvid R. Molander, *Lysekil.*

M. le Dr. Nils Rosén, Intendant de Pêcheries, District de l'Ouest, *Göteborg.*

M. N. O. Zeilon, Professeur à l'Université, *Lund.*

Invités pour prendre part aux Réunions spéciales scientifiques:

M. V. Walfrid Ekman, Professeur à l'Université, *Lund, Suède.*

*M. le Professeur G. I. Taylor, F. R. S., Trinity College, *Cambridge, Grande Bretagne.*

M. le Dr. H. Thorade, Börnestr. 33, *Hamburg 23, Allemagne.*

Hôtes: M. R. Seymour Sewell, Lt.-Col., Director of the Zoological Survey of India, Earl Street, *Cambridge.*

M. J. A. Clowes, »Discovery Committee«, Colonial Office, *London S. W. 1.*

M. Geo. Hogarth, Chairman of the Fishery Board for Scotland, *Edinburgh.*

* Empêché d'assister à la réunion.

AGENDA

for the twentyfifth Meeting of the International Council for the Exploration of the Sea.

1. Opening of the Proceedings by the President.
2. Report as to the present participation.
3. Administrative Report.
4. Statement of Accounts for 1930—1931 and final Approval of same.
5. Statement of Accounts for 1931—1932.
6. Arrangements for Scientific Meetings and adjustments, if any, of the circulated programmes of proceedings.
7. Discussion of the proposal of the Bureau with regard to Prof. Odón de Buen's suggestion regarding biennial meetings.
8. Consideration of the position of the Transition Area Committee, the Plankton Committee and the Salmon & Trout Committee.
9. Consideration of Reports and Programmes of the Committees.
10. Estimates for the financial year 1932—1933.
11. Nomination of the members of the Bureau, the Finance Committee, the Editorial Committee, the Editors, etc.
12. Time and place for the next Council Meeting.
13. Other business.
14. Conclusion of the Meeting.

REPORT

of

the twentyfifth Meeting of the Council.

First Sitting: Monday, June 20th, at 11,00 a. m.

The President, Mr. MAURICE, in the chair.
Present: The members and experts (vide list pp. 4—7).

Under **Point 1** of the Agenda the President formally opened the proceedings in the following words:—

Messieurs les Délégués et Experts.

J'ai l'honneur de déclarer ouverte la 25ième session du Conseil International.

Avant de passer à l'ordre du jour, saluons, Messieurs, la mémoire de JOHANSEN, associé depuis 1902 aux travaux du Conseil et connu particulièrement pour ses recherches si utiles sur la plie et le hareng. Nous l'avons tous apprécié comme un technicien habile, minutieux, sincère, modeste, tenant surtout à ce que ses travaux eussent des résultats pratiques au profit des pêches et des pêcheurs.

En déplorant la perte du savant nous déplorons aussi celle de l'ami fidèle, sans prétention et si sincère.

Dr. SCHMIDT, Dr. KNUDSEN, dans ces dernières années la mort a lourdement frappé la Commission Danoise. Nous vous offrons nos condoléances sincères pour ce nouveau deuil et nous vous prions d'être nos interprêtes pour adresser à la famille de notre ami regretté et à sa patrie l'expression de notre sympathie attristée.

En l'honneur de notre collègue disparu, je vous demande, Messieurs, de vous recueuillir en silence.

Prof. KNUDSEN spoke as follows:—

Au nom de la Délégation danoise je tiens à vous remercier pour les paroles cordiales que vous venez de prononcer. Nous aussi sommes lourdement frappés par la mort de JOHANSEN. Nous ferons part de votre sympathie au Gouvernement Danois et à la famille de notre collègue.

The President resumed:—

Je dois aussi, Messieurs, citer le nom d'un autre savant disparu depuis notre dernière séance, qui a largement contribué à la science de la mer. Le Professeur WILLIAM CARMICHAEL M'INTOSH mourut le premier avril 1931 agé de 92 ans. Il ne participa jamais aux travaux du Conseil mais nous avons su apprécier sa capacité et sa valeur, et nous croyons devoir offrir à nos collègues écossais nos condoléances.

Nous saluons avec grand plaisir deux Délégués qui siègent parmi nous aujourd'hui pour la première fois, M. le Contre-Amiral TITO DE MORAIS, Délégué du Portugal, et M. le Professeur DAMAS, Délégué de la Belgique. Soyez tous deux les bienvenus.

Contre-Amiral de MORAIS spoke as follows:

M. le Président, je vous présente mes remerciements pour votre bon accueuil.

The President resumed:

De plus, je suis certain d'être l'interprête des sentiments de tous en exprimant à M. le Docteur RAMALHO le grand plaisir que nous éprouvons de le retrouver à nouveau en qualité de Délégué du Portugal.

Messieurs les Experts, qui siègez ici pour la première fois, et que je ne nomme pas par peur d'omettre certain d'entre vous; nous vous souhaitons à tous la plus cordiale bienvenue.

Nous sommes heureux de voir parmi nous deux savants qui sont nos hôtes: Lt. Colonel SEYMOUR SEWELL, Director of the Zoological Survey of India, qui, en train d'organiser une expédition océanographique a exprimé le désir de s'entretenir avec les océanographes du Conseil et que je me suis permis d'inviter en votre nom à notre réunion.

Il en est de même pour M. CLOWES, hydrographe du Discovery Committee qui, lui aussi cherche l'occasion de discuter avec nous certains problèmes hydrologiques.

Col. SEWELL, M. CLOWES, soyez les bienvenus.

Vous savez, Messieurs, que notre vieil ami, le Capitaine SCHØNING, terminera au mois de juillet sa longue période de service au Bureau du Conseil et je me reserve d'en parler plus longuement à la séance de clôture. Dès maintenant, je vous présente M. le Capitaine NELLEMOSE qui a été nommé par le Bureau pour lui succéder. Depuis le premier juin il s'efforce de se familiariser à nos travaux. Je suis certain qu'il sera bien accueilli par vous et qu'il fera tout son possible pour remplir complètement les devoirs de sa nouvelle charge.

Je vous propose d'adresser selon notre coutume par télégramme nos hommages d'affectueux respect à Sa Majesté le Roi de Danemark.

Enfin me chargerai-je de remercier en votre nom M. le Chambellan BERNHOFT pour les mesures que le Gouvernement du Roi a bien voulu prendre pour vous reçevoir ici à Christiansborg.

Point 2 of the Agenda. Report as to the present Participation.

The President stated that Italy had now formally retired from the Council.

Point 3 of the Agenda. Administrative Report.

As the Administrative Report had only just been circulated the President proposed that an opportunity for comment upon it should be given at the final Council Meeting.

Point 4 of the Agenda. Statement of Accounts for 1930—31 and final approval of same.

The Accounts for 1930—31 which had been audited and had also been checked by the Finance Committee were finally approved.

Point 5 of the Agenda. Statement of Accounts for 1931—32.

The President stated that the Accounts for 1931—32 had only just been circulated. He proposed to defer further consideration of them to the next sitting. Any member, who so desired, would find the details at "Eltham".

Point 6 of the Agenda. Arrangements for Scientific Meetings and adjustments, if any, of the circulated Programme.

The President pointed out that the programme was rather congested, and that there was doubt whether it would be possible to finish the Biological Scientific Meeting so early that a meeting of the Consultative Committee might take place in the same afternoon as anticipated in the programme. He would be glad to know whether there would be any objections to holding the final Council Meeting on Saturday at noon or even in the afternoon.

From the silence of the members the President assumed that no one objected to a possible alteration of the programme to this effect.

Point 7 of the Agenda. Discussion of the proposal of the Bureau with regard to Prof. Odón de Buen's suggestion regarding biennial meetings.

The President referred to Prof. O. DE BUEN's proposal which had last year been discussed in a meeting of the Council without Experts, during which it had been agreed to leave the question in the hands of the Bureau. The Bureau had discussed the question at great length at its meeting in Oslo last April. They had come to the conclusion that it would be desirable to continue to have annual meetings, because both administratively and scientifically the continuity of the Council's work would be best preserved by adhering to established practice. They had then turned to the question whether the proceedings of the Council could be shortened so that Delegates and Experts needed not be so long absent from their countries. It had been suggested that this might be achieved by restricting the number of scientific meetings e. g. by holding such meetings only once in two years, and by shortening the proceedings of the various Committees. In this connection it had been suggested that members of the Committees who had scientific communications to make should circulate papers beforehand - which papers might be taken as read.

The Bureau was averse to suggesting to the Council any fixed regulation on the subject because such regulations might prove embarrassing in practice. The Bureau had accordingly requested the Consultative Committee to discuss all these possibilities and the question generally and to report through the Bureau to the Council.

Point 8 of the Agenda. Consideration of the position of the Transition Area Committee, the Plankton Committee and the Salmon and Trout Committee.

The President said that the Bureau had for some time been in doubt whether the areas of the Transition and Baltic Committee could not be most rationally studied as one combined area under one Committee. They had taken this question into consideration at their meeting at Oslo and had invited Dr. ANDERSSON, chairman of the Baltic Committee, to assist them in their deliberations. It appeared, as the result of discussion, that there were differences between the problems of the two areas which invited some differentiation of treatment; but whether this differentiation would best be made by the maintenance of two committees appeared to the Bureau to be a point to be referred to the Consultative Committee and the Combined Baltic and Transition Area Committee. They had accordingly invited the Consultative Committee to take the question into consideration at their first meeting.

The Bureau had also taken into consideration the position of the Plankton Com-

mittee and decided that it would recommend the continuance of this Committee for the present.

With regard to the Salmon and Trout Committee the Bureau had decided to recommend its continuance for the present, but suggested that the question whether the Committee might not take over full responsibility for all salmon work in the Baltic and the Transition Area Committees should be discussed in the respective Committees and in the Consultative Committee.

The President expressed the hope that the Delegates would be satisfied to leave these questions to the Consultative Committee.

Point 13 of the Agenda. Other business.

The President stated that the Bureau in discussing the budget and the cost of printing had found it necessary to consider whether the large part of the expenses attributable to the hydrographical service and publications could be reduced. In particular they thought that the publication of the masses of figures which form so large a part of some of the hydrographical publications was difficult to justify. They had, therefore, asked the Consultative Committee and desired the Hydrographical Committee also to take the whole subject into consideration and in particular to consider whether the needs of science would not be met by publishing summarised reports of results and keeping copies of the original data in a form in which they could be made available for those who might wish to consult them in detail.

The meeting adjourned.

Second Sitting: Saturday, June 25th, at 3 p. m.

The President, Mr. MAURICE, in the chair.
Present: the members and experts (vide list pp. 4—7).

The President opened the meeting and stated that in accordance with the decision of the first sitting of the Council the following telegram had been sent to his Majesty the King of Denmark:—

»A sa Majesté le Roi de Danemark.
Les membres du Conseil International pour l'Exploration de la Mer réunis à Copenhague demandent la permission de témoigner à Votre Majesté leurs sentiments les plus respectueux.

MAURICE, Président,
Copenhague.«

in reply to which the following telegram had been received from the King:—

»Mes remerciments sincères.

CHRISTIAN R.«

Point 3 of the Agenda. Administrative Report.

No observations having been received on the report it was adopted without amendment.

Point 5 of Agenda. Statement of Accounts for 1931—32.

The statement of account was approved.

Point 7 of the Agenda. Discussion of the proposal of the Bureau with regard to Prof. Odón de Buen's suggestion regarding biennial meetings.

The President said that this question had been discussed at some length by the Bureau and eventually referred by them to the Consultative Committee. The Consultative Committee had further referred it to a Sub-Committee presided over by Dr. Heinrici and the report of the Consultative Committee was based upon the report of the Sub-Committee. He invited Prof. Hjort to lay before the Council the recommendations of the Consultative Committee.

Prof. Hjort said that after considering the report of the Sub-Committee the Consultative Committee had recommended that no Scientific Meeting should be held in 1933, but that, in 1934, there should again be held Biological and Hydrographical Scientific Meetings, and that the main subject for discussion at the Biological Scientific Meeting in 1934 should be that suggested by the Plankton Committee, namely the influence of light on the development and movements of Plankton. As the Hydrographical Committee wished to devote a whole day to their deliberations next year the Consultative Committee recommended that provision should be made to this effect in the programme of proceedings. Other Committees whose members were not members of the Hydrographical Committee could, of course, sit upon the same day. It was further recommended that any decision as to the future organisation of the Meetings should be deferred to the next Meeting. Professor Hjort thanked the Sub-Committee for its work.

Le Prof. Odón de Buen déclare que la proposition du Comité Consultatif n'apporte aucune amélioration en ce qui concerne la délégation espagnole; il pense qu'il sera difficile pour cette délégation d'assister à la réunion de l'année prochaine.

The President referring to the fact that the question of the future organisation of the scientific meetings should be considered next year expressed the hope that it would be possible for the Spanish delegation to attend the meeting.

Le Prof. Rafaël de Buen exprime que c'est une nécessité pour les pays éloignés du Danemark de considérer la question au point de vue financier; en ne tenant des réunions scientifiques spéciales que tous les deux ans, c'est le Conseil lui même qui fait une économie, en n'ayant pas à payer les frais de voyage des experts spécialement invités pour y prendre part. Si l'on continue les réunions annuelles il ne voit pas d'inconvénient à tenir aussi les réunions scientifiques annuellement.

The President said that the Bureau, when considering the question had felt that it was most desirable to hold annual Meetings in order to maintain the continuity of the work of the Council.

M. Théodore Tissier fait remarquer à M. de Buen qu'il y a deux sortes de dépenses: 1) les frais de voyage et 2) les frais de séjour, et qu'en tenant des sessions plus courtes tous les deux ans on arrive à faire des économies sur ces frais de séjour. Il ajoute que de plus, selon l'habitude prise par le Conseil, les réunions tous les trois ou quatre ans ont lieu en dehors de Copenhague et qu'il est possible de trouver un lieu de réunion plus central.

Le Prof. Rafaël de Buen répond que pour la délégation espagnole la question la plus grave est celle des frais de voyage. En vue d'une coopération plus étroite elle désire envoyer un plus grand nombre d'experts aux réunions, car il est difficile pour deux délégués d'apporter à toutes les réunions des Comités une contribution efficace.

The President appreciated this point of view, and expressed the hope that the Spanish Delegates would in future be in a position to bring with them a greater number of experts in alternate years. For the present, however, it seemed to be clearly necessary for the Council to defer any final decision on the question.

Point 8 of the Agenda. Consideration of the position of the Transition Area Committee, the Plankton Committee and the Salmon & Trout Committee.

Transition Area Committee. The President said that the question whether the Council was justified in continuing to maintain two separate Committees for the Baltic and Transition Area had caused the Bureau some anxiety. The following three alternatives:—

1) Maintenance of the *status quo*,
2) One Committee for the two Areas with two Sub-Committees,
3) One Committee for the two Areas with two reporters,

had been laid before a joint meeting of the Baltic and Transition Area Committees, presided over by Dr. Andersson. After this meeting Dr. Andersson had laid a memorandum before the Consultative Committee (see page 60). The President asked Dr. Andersson to explain to the Council why the Committees had adopted the first alternative and rejected the others.

Dr. Andersson briefly summed up his Memorandum and

the President asked whether any member had observations to add.

Dr. le Danois fait remarquer que la complexité des questions scientifiques qui font l'object d'un Comité ne justifie pas sa division, mais que l'expérience ayant montré que le Conseil avait intérêt à maintenir l'état de choses actuel, aucune objection ne peut être faite à cette situation.

The proposal was adopted.

Plankton Committee. The President stated that the Consultative Committee had recommended the continuance of the Plankton Committee and considered that this Committee should fix its own programme. The Bureau agreed. The proposal was adopted.

Salmon and Trout Committee. The President stated that the Bureau concurred in the recommendation that this Committee should be maintained. As suggested in the first sitting of the Council the Baltic Committee and the Salmon and Trout Committee in a joint meeting had considered the questions affecting salmon and trout in the Baltic and had come to the conclusion that such questions should be referred to and dealt with by the Salmon Committee, with the *proviso* that the preparation of resolutions which might lead to international conventions for distinct areas would, of course, fall to the appropriate Area Committee. (See Recommendation p. 92).

The recommendation was adopted.

Point 9 of the Agenda. Consideration of Reports and Programmes of the Committees.

The President called on Prof. HJORT who referred to the Recommendations of the Consultative Committee which had just been circulated. Prof. HJORT said that the Consultative Committee had adopted all recommendations of the reports of Committees and drew special attention to the recommendations of the Baltic Committee and the Whaling Committee, asking whether any member had objections to put forward.

Dr. RAMALHO begged to remark on behalf of the Portuguese Delegates that, although sympathising with the expected result of the "Reduced Production Agreement" adopted by the Association of Whaling Companies on the protection of the stock of whales, they did not intend to recommend any infraction of the legal principles of their country or any other, as, for instance, those that prohibit producers of any commodities to combine, for private reasons, to reduce their collective production.

Prof. HJORT said that in order to meet Dr. RAMALHO's objection, which in his opinion referred to the first version only of the recommendation put before the Consultative Committee, the Whaling Committee had changed the wording to "valuable measure" and expressed the hope that the Portuguese Delegates would agree to this.

Dr. RAMALHO pointed out that the Portuguese Delegates made no objections, but wanted to point out that they were not legal experts, and therefore thought it necessary to make the reservation he had made.

The President pointed out that the adoption of the recommendations of the Consultative Committee involved only a few expenses for printing and travelling for which, however, provision had already been made in the budget.

The Council adopted all the reports of the Committees en bloc in the form in which they are printed herewith (see pp. 28—97).

The report of the Editorial Committee was laid before the Council and adopted.

Point 10 of the Agenda. Estimates for the financial year 1932—33.

The President referring to the Estimates drew attention to the fact that the receipts had been reduced by 5000 Kr. as compared with the sum printed in the Estimates circulated a month before the Council Meeting, having regard to a renewed demand from Belgium, who had last year paid her full contribution, for a reduction of the contribution. The question would as usual be referred to the Governments [1]).

The President asked for a formal Resolution by the Council affirming the reduction of all honoraria from the 21st July. This was adopted.

The President referred to the Estimate of printing costs specified in the note which had been circulated and amounting to 59,700 Kr. Through the various reductions agreed upon by the competent Committees and alterations of the form of printing in contemplation it was anticipated that the sum of 45,000 Kr. set down in the circulated printed Estimates would suffice.

After taking into consideration certain minor adjustments the total expenditure

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[1]) The Belgian Government has since withdrawn its request.

amounted to Kr. 160,722, against a revenue of Kr. 162,000, leaving a balance of about Kr. 1,300.

The Budget was adopted.

The President further informed the members that the Bureau recommended the grant to Captain SCHØNING, whose appointment had made no provision for pension, of a sum of 15,000 Kr. to be paid in the following way: 5000 Kr. the first year, 4000 Kr. the second and 3000 Kr. the two following years.

This was adopted by acclamation.

Point 11 of the Agenda. Nomination of the members of the Bureau, the Finance Committee, the Editorial Committee, the Editors, etc.

The President informed the members that in spite of the other Bureau members' entreaties Prof. PETTERSSON had decided to give up his membership of the Bureau.

M. THÉODORE TISSIER dit qu'il est certain que le Conseil est unanime à regretter la décision du Professeur PETTERSSON qui est le seul à croire qu'il est trop agé pour siéger au Bureau. Il suggère au Conseil l'idée de rendre cette décision inefficace en conservant quand même le Prof. PETTERSSON dans le Bureau comme Président d'honneur, place plus digne de lui dans ce Conseil dont il est un des fondateurs et dans lequel il a travaillé pendant trente ans. Dans cette qualité le Prof. PETTERSSON sera toujours accepté au Bureau quand il le désirera. (Applause).

Prof. PETTERSSON said the he could hardly find the proper words to express his gratitude, he could only thank the members most heartily for the great honour they had bestowed on him, it was the greatest distinction of honour he had ever received. Prof. PETTERSSON also expressed his thanks for all the kindness shown to him during the 30 years he had been a member of the Bureau.

Prof. PETTERSSON then said that now being outside the Bureau he begged to propose the re-election of the present Bureau, and, to fill the vacancy caused by his retirement, he proposed the election of Prof. SCHMIDT. He added that although the Bureau was an administrative body he thought all agreed that it should contain some men of science familiar with the sea and the study of the sea. In proposing Prof. SCHMIDT for election he thought he needed only refer to his remarkable work at sea, with which all were familiar, to secure a unanimous vote in his favour.

Prof. KNUDSEN seconded him, and 1) the existing Bureau with exception of Prof. PETTERSSON was re-elected, 2) the vacancy was filled by the unanimous election of Prof. SCHMIDT (Applause).

Mr. VAN RIEL spoke as follows:—

Mr. President. Allow me some few words. By the decision of Prof. PETTERSSON the Bureau has suffered a severe loss. We all agree upon that. His place has, however, been taken by a scientist of no less merit. We all know what Prof. SCHMIDT has done for the exploration of the sea. But the Hydrographical Committee has not only lost its best member, as I understand it, but also its member who represents the Hydrographical Committee in the Bureau and who has so often shown that he understood the needs of Hydrography. For this reason I want to ask the Bureau and also the various delegates to remember and to take into consideration the loss we suffered in 1932 when the next time a place is vacant in the Bureau.

In reply to which the President drew the attention to the fact that Prof. Pettersson was still a member of the Hydrographical Committee and that as a result of the adoption by the Council of M. Tissier's proposal Prof. Pettersson would have the right of entry to Bureau Meetings and thus the Hydrographical Committee would still have him in the Bureau.

The following were nominated members of the Finance Committee:— The President, *ex officio*, Professor Knudsen and Professor Schmidt as permanent members, and Professor Damas, Admiral Tito de Morais and Prof. Siedlecki.

The Editorial Committee was re-elected with Prof. Pettersson as Chairman.

Prof. D'Arcy Thompson was re-elected as Editor for Statistics.

Dr. E. S. Russel was re-elected as Editor for the Journal.

Prof. M. Knudsen was re-elected as Hydrographical Consultant.

Point 12 of the Agenda. Time and place for the next Council Meeting.

The President asked the members to allow the Bureau to deal with this question by correspondence. This was agreed to.

Point 13 of the Agenda. Other business.

The President referring to the decision taken last year to study the possibility of the adoption of standard methods for the sanitary control of shellfish, said that the Bureau had resolved that the anticipated meeting of shellfish experts should be held outside the Council Meeting. Dr. Tesch who was convener of the meeting had suggested holding the meeting in Middelburg in September. The President suggested that the following countries should be represented on the Committee:— Belgium, England, France, Germany, Holland and the Irish Free State on the understanding that the Council would pay the travelling expenses for one expert only from each country. He asked whether any other country wanted to be represented on the Committee.

Dr. Ramalho wanted to have Portugal represented and

Prof. Schmidt wanted to send a Danish expert.

The proposals were adopted.

Point 13 of Agenda. Conclusion of the Meeting.

On the motion of the President the following votes of thanks were accorded by acclamation:—

To the Danish Foreign office for providing accomodation,

to the Danish Commission for their hospitality,

to the Director of the Carlsberg breweries to whom it was resolved that the President should write a letter of thanks for hospitality,

to the Chairman of the Consultative Committee and to the members of the staff.

Finally the President said that he had a pleasant duty to perform on behalf of his colleagues. For twenty years past Captain Schøning had served the International Council, first as statistical officer and later as Administrative Secretary, and during this time made a multitude of friends. According to an agreement between him and the Bureau his term of office had now come to an end. Turning to the Administrative Secretary he said:—

We say good-by to you with great regret; we thank you for all that you have done

for us in the past; you take with you our warm regards. All your many friends here have asked me, as their representative, to ask you to accept the content of this box as a lasting evidence of their affection and a reminder, as they hope, of happy days spent in work together, the remembrance of which they hope may be as pleasant to you as it is to all of us.

Capt. SCHØNING thanked the President for his kind and flattering words which he appreciated very much. He further thanked all the members for all their kindness, for having agreed to pay him a pension for the next 4 years and for the very nice present which he would keep as a friendly remembrance in the years to come.

Prof. SIEDLECKI referring to the several very difficult questions which had been settled in perfect harmony thanked the President, who was asked to be specialist in all Committees and in all questions arising. He thought he expressed the general opinion in thanking the President for his indefatigable work in the interest of the Council. (Applause).

The President briefly thanked Prof. SIEDLECKI for his very kind words and the kind thought which had inspired them, and the Council for the manner in which they had received Prof. SIEDLECKI's proposal.

ESTIMATES

of

the International Council for the Study of the Sea for the financial year 1932—33.

Receipts:—

Head	No.	Item	Kroner	Kroner
I	1	**BALANCE** on the 31st March 1932 constituting the reserve of the Council ..... ca.		191,391,75[1])
		ORDINARY RECEIPTS:—		
II	2	**Annual Contributions of the Governments**	152,000,00*	
III	3	**Interests on bank deposit** ..... estimated	1,500,00	
IV	4	**Interests on Treasury Bonds**	6,000,00	
V	5	**Sale of publications** ..... estimated	2,500,00	162,000,00*
		Total Receipts... estimated		353,391,75*

[1]) **Balance:—**

Kr. 118.543,43 Danish Treasury Bonds.

» 72,848,32 Cash and deposited in the Handelsbank and the savings bank.

Kr. 191,391,75

Expenditure:—

Head	No.	Item	Kroner	Kroner
I		**ORDINARY EXPENDITURE:—**		
		Incidental expenses:—		
	1	President	5,700,00	
	2	Chairman of the Editorial Committee	1,900,00	
	3	Hydrographic Consultant	2,850,00	
	4	Editor for Statistics	1,900,00	
	5	Editor of the Journal	3,800,00	
			16,150,00	16,150,00
II		**Administrative Staff:—**		
	6	Administrative Secretary	4,045,16 6,666,67	
	7	1st Assistant Secretary	5,600,00	
	8	2nd Assistant Secretary	4,350,00	
	9	Hydrographic Staff	12,133,33	
	10	Statistical Assistant	3,866,66	36,661,82
III		**Expenses of the office in Copenhagen:—**		
	11	Rent, service, heating, stationery, books, binding of books, light, gas, telephone, telegrams, insurance, postage, freight, typewriting and miscellaneous expenses	14,000,00	14,000,00
IV	12	**Travelling expenses**	15,000,00	15,000,00
V	13	**Chairmen of Committees**	29,550,00	29,550,00
VI	14	**Printing and distribution**	45,000,00	45,000,00
VII	15	**Transferred to Pension Fund**	3,500,00	3,500,00
		to carry forward...		159,861,82

Head	No.	Item	Kroner	Kroner
		Brought forward...		159,861,82
VIII		**EXTRAORDINARY EXPENDITURE:—**		
	17	**Special Resolutions:**—		
		(a) Chargeable to revenue.		
		Supplementary expenditure for Binding of books.....	200,00	
		Compensation for double rent paid by the new Administrative Secretary on account of short notice	660,60	860,60
				160,722,42
		(b) Chargeable to reserve.		
		Mrs. Drechsel's pension	6,500,00	
		Capt. Schøning	3,467,73	
		Cost of production of Prof. Joubin's Fiches Faunistiques	9,000,00	
		Honorarium to Prof. Joubin for four sets of Fiches Faunistiques.....	1,000,00	19,967,73
		Total Expenditure...		180,690,15

Annual Contributions of the Governments.

Belgium	5,000,00*
Great Britain	20,000,00
Denmark.....	10,000,00
Finland.....	5,000,00
France	20,000,00
Germany.....	20,000,00
Irish Free State	5,000,00
Netherlands	10,000,00
Norway	10,000,00
Poland.....	10,000,00
Portugal	5,000,00
Spain	20,000,00
Sweden	10,000,00
Latvia	2,000,00
Kr....	152,000,00

* Since the Council Meeting information has been received according to which the Belgian Contribution for the present year will be 10,000 Kr. The estimated income therefore will be raised by 5,000 Kr.

Special Reserve for Pensions.

Treasury Bonds and Bank Deposit at 31st March 1932	Kr.	24,150,63
Interests from Treasury Bonds falling due in 1932—33	-	3,500,00
Interests from the Special Reserve itself ..... estimated	-	1,266,00
	Kr.	28,916,63

ESTIMATES *)

of

Publications to be printed during the financial year 1932—33.

Series	Subject	Authorisation	Estimated cost Kroner
Rapp. & Proc.-Verb.	Procès-Verbaux 1932	Standing order	3,700.00
—	Rapport Atlantique 1931	— —	2,000.00
—	Reports of the Scientific Meetings	— —	2,800.00
—	Report on Carbonic Acid Investigations	Bureau resolution	2,000.00
—	North Western Area Report	Proc.-Verb. current issue p. 98	2,500.00
—	Report on Experiments with Plankton nets	Proc.-Verb. current issue p. 98	900.00
Bulletin	Hydrographique	Standing order	4,500.00
—	Offprints of Bull. Hydr. for monthly distribution	Proc.-Verb. Vol. LX p. 12	600.00
—	Density Tables (Mr. MATTHEWS)	Proc.-Verb. Vol. LXXIV p. 19	1,500.00
—	Atlas of Temperature and Salinity in the North Sea and the Channel	Proc.-Verb. current issue p. 98	3,900.00
—	Investigations of Submarine Waves in the Cattegat	Proc.-Verb. current issue p. 98	4,000.00
—	Statistique	Standing order	2,800.00
Journal du Conseil	Vol. VII, Nos. 1—3	— —	8,000.00
		Total...	Kr. 39,200.00

Other costs of publication:

Translations, etc.	Kr. 2,300.00
Distribution	- 3,500.00
	Kr. 45,000.00

*) NB. These Estimates are framed as closely as the conditions permit, but are inevitably subject to considerable variation according to the ultimate cost of production.

List of Members of Committees.

Consultative Committee.

Professor Johan Hjort, Chairman,
Mr. Oscar Sund,
Professor Johs. Schmidt,
Dr. Ed. le Danois,
Professor Rafael de Buen,
Prof. G. Gilson,
Prof. W. Mielck,
Dr. A. Bowman,
Mr. J. O. Borley,
Dr. H. Blegvad,
Dr. K. A. Andersson,
Professor Martin Knudsen,
Professor H. H. Gran,
Professor D'Arcy W. Thompson,
Professor M. Siedlecki,
Dr. E. S. Russell.

North Eastern Area Committee.

Norway:	Professor Johan Hjort, Chairman,
	Mr. Oscar Sund, Vice-Chairman,
	Mr. S. K. Asserson,
Denmark:	Professor Johs. Schmidt,
England:	Dr. E. S. Russell,
France:	Commandant Charcot,
	failing him Dr. Ed. le Danois,
Germany:	Dr. H. Lübbert,
Scotland:	Dr. R. S. Clark,
Sweden:	Dr. K. A. Andersson,

North Western Area Committee.

Denmark:	Professor Johs. Schmidt, Chairman,
England:	Dr. E. S. Russell,
France:	Dr. Ed. le Danois,
Germany:	Professor E. Ehrenbaum,
Norway:	Mr. Oscar Sund,
Scotland:	Dr. A. Bowman.

Atlantic Slope Committee.

France:	Dr. Ed. le Danois, Chairman,
	Professor L. Joubin,
	Professor L. Roule,
	Mr. G. Belloc,

Spain:	Professor Rafael de Buen, Vice-Chairman.
	Professor José Giral,
Denmark:	Professor Johs. Schmidt,
England:	Mr. H. W. Harvey,
	Dr. E. S. Russell,
Germany:	Professor G. Schott,
	Professor A. Defant,
Irish Free State:	Mr. G. P. Farran,
Norway:	Professor Johan Hjort,
Portugal:	Dr. A. Ramalho.

Combined North Sea and Eastern Channel Committee.

Professor G. Gilson, Chairman.

Northern North Sea Committee.

Scotland:	Dr. A. Bowman, Chairman,
Denmark:	Professor Johs. Schmidt,
	Dr. H. Blegvad,
England:	Mr. F. M. Davis,
France:	Mr. J. le Gall,
Germany:	Professor E. Ehrenbaum,
Holland:	Dr. J. J. Tesch,
Norway:	Mr. Oscar Sund,
Poland:	Mr. J. Borowik,
Sweden:	Professor O. Pettersson,
	Dr. A. R. Molander.

Southern North Sea Committee.

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Belgium:	Professor G. Gilson,
Denmark:	Prof. Johs. Schmidt,
	Dr. H. Blegvad,
England:	Mr. F. M. Davis,
France:	Mr. J. le Gall,
Holland:	Mr. P. M. van Riel,
	Dr. J. J. Tesch,
Norway:	Mr. Paul Bjerkan,
Scotland:	Dr. A. Bowman,
Sweden:	Dr. K. A. Andersson.

Transition Area Committee.

Denmark:	Dr. H. Blegvad, Chairman,
	Professor Martin Knudsen,
	Dr. E. M. Poulsen,
Germany:	Dr. S. Strodtmann,
	Dr. E. Fischer,
Norway:	Mr. Paul Bjerkan,
Sweden:	Professor O. Pettersson,
	Dr. K. A. Andersson.

Baltic Area Committee.

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	Dr. H. Blegvad,
	Dr. E. M. Poulsen,
Finland:	Professor R. Witting,
	Professor T. H. Järvi,
Germany:	Dr. E. Fischer,
Latvia:	Mr. V. Miezis,
Poland:	Professor M. Siedlecki,
	Mr. J. Borowik.

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	Dr. J. N. Carruthers,
	Mr. J. R. Lumby,
Finland:	Professor R. Witting,
France:	Dr. Ed. le Danois,
	Mr. J. le Gall,
	Mr. G. Belloc,
Germany:	Professor B. Schulz,
Holland:	Mr. P. M. van Riel,
	Professor E. van Everdingen,
Irish Free State:	Mr. G. P. Farran,
Latvia:	Mr. V. Miezis,
Norway:	Professor Johan Hjort,
	Mr. Oscar Sund,
Poland:	Professor M. Siedlecki,
Portugal:	Rear-Admiral Tito de Morais.
Scotland:	Professor D'Arcy W. Thompson,

Spain:	Mr. Léon Herrero,
	Professor José Giral,
	failing them Professor Rafael de Buen.
Sweden:	Professor O. Pettersson,
	Professor N. O. Zeilon.

Plankton Committee.

Norway:	Professor H. H. Gran, Chairman,
	Mr. Paul Bjerkan,
Belgium:	Professor G. Gilson,
Denmark:	Professor Ove Paulsen,
	Dr. P. Jespersen,
England:	Mr. R. E. Savage,
France:	Mr. J. le Gall,
	Mr. G. Belloc,
Germany:	Professor W. Mielck,
Holland:	Dr. J. J. Tesch,
Irish Free State:	Mr. G. P. Farran,
Latvia:	Mr. V. Miezis,
Poland:	Dr. A. Litynski,
Portugal:	Dr. A. Ramalho,
Scotland:	Dr. R. S. Clark,
Spain:	Dr. Juan Cuesta Urcelay,
Sweden:	Dr. K. A. Andersson.

Statistical Committee.

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Belgium:	Professor G. Gilson,
Denmark:	Mr. F. V. Mortensen,
	M. Å. J. C. Jensen,
England:	Dr. E. S. Russell,
	Mr. T. Edser,
Finland:	Professor T. H. Järvi,
France:	Mr. G. Lecourbe,
Germany:	Dr. E. Fischer,
Holland:	Dr. J. J. Tesch,
Irish Free State:	Mr. C. Green,
Latvia:	Mr. V. Miezis,
Norway:	Mr. S. K. Asserson,
Poland:	Mr. J. Borowik,
Spain:	Mr. le Com. José Maria Roldán.
	Dr. Fernando de Buen,
Sweden:	Dr. K. A. Andersson.

Salmon and Trout Committee.

Poland:	Professor M. Siedlecki, Chairman,
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Denmark:	Dr. H. Blegvad,
	Dr. E. M. Poulsen,
England:	Dr. E. S. Russell,
Finland:	Professor T. H. Järvi,
France:	Professor L. Roule,
Germany:	Professor E. Ehrenbaum,
	Professor A. Willer,
	Dr. W. Schnakenbeck,
Irish Free State:	Mr. R. Southern,
Latvia:	Mr. V. Miezis,
Scotland:	Mr. W. J. M. Menzies,
Spain:	Dr. Fernando de Buen,
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Dr. Fernando de Buen,
Dr. Ed. le Danois,
Dr. A. Bowman,
Professor Johs. Schmidt,
Dr. A. Ramalho,
Dr. H. Lübbert.

Editorial Committee.

Professor O. Pettersson, Chairman,
Professor D'Arcy W. Thompson,
Professor G. Gilson,
Professor L. Joubin,
failing him Dr. Ed. le Danois,
Professor Martin Knudsen,
Professor E. Ehrenbaum,
Professor Odón de Buen,
Professor M. Siedlecki,
Dr. E. S. Russell.

Finance Committee.

The President,
Professor M. KNUDSEN,
Professor JOHS. SCHMIDT,
Professor D. DAMAS,
Rear-Admiral TITO DE MORAIS,
Professor M. SIEDLECKI.

Special Committee.

Committee for the Study of the Tunny.

Mr. G. BELLOC,
Dr. F. DE BUEN,
Dr. FRADE.

Recommendations of the Consultative Committee.

The Committee met on June 20th 1932, at 2.00 p.m., on June 23rd at 4.30 p.m. and on June 25th at 9.30 a.m.
Chairman: Professor JOHAN HJORT.

1. Special Scientific Meetings.

After considering the report of the Sub-committee for the Scientific Meetings (see App. 1) the Committee recommended that no Scientific Meeting be held in 1933 but that one day be reserved for the discussion of hydrographical questions — other Committee meetings to take place besides. They proposed that definite plans for the future organisation of the Scientific Meetings be decided upon at the next meeting of this Committee. They further proposed that the main subject for discussion at the Biological Meeting in 1934 should be that suggested by the Plankton Committee, namely the influence of light on the development and movements of Plankton.

2. Protection of Fish.

The Committee recommended to the Council that Recommendations 1 and 2 of the Baltic Committee concerning the introduction of protective measures for flounder and salmon should be brought to the notice of the Governments concerned for their consideration.

The Committee, after considering the conclusions of the Biological Scientific Meeting (see below), recommended the adoption by the Council of the following recommendations:—

a) The International Council recommends that the several Governments should induce the Trawling Industry in the countries concerned to experiment with trawl-nets

Conclusions of the Biological Scientific Meeting.

I. The natural history of the Herring, and the herring fisheries of the several countries have been intensively studied: and an intimate knowledge has been acquired of the biology of this fish, and of the composition of its shoals with regard to age, sex, maturity and origin. Furthermore, the catch of small herrings in Norway, Great Britain, Holland and Germany, and the trawl-fishery for herring, have been taken into careful consideration. According to our present knowledge it may be declared for the seas of Northern Europe — except the Baltic, for which our information is not sufficient — that:—

The present method, and present extent, of capture of young herrings do not involve appreciable damage to the stock, nor (consequently) to the yield of the fisheries.

II. From the Council's study and investigation of the Haddock, the Meeting draws the conclusion that in the interest of the upkeep of the stock the present extent of capture of the younger year-classes is extremely undesirable: and that a considerable saving of these year-classes could be effected by the use of trawl-nets with larger mesh.

Recommandations du Comité Consultatif.

Le Comité se réunit le 20 Juin 1932 à 2h p.m., le 23 Juin à 4h30 p.m. et le 25 Juin à 9h30 a.m.
Président: Prof. Johan Hjort.

1. Réunions Scientifiques Spéciales.

Après examen du rapport du Sous-comité pour les Réunions Scientifiques (voir App. 1) le Comité recommande qu'il ne se tienne pas de Réunion Scientifique en 1933, mais qu'une journée soit réservée pour la discussion des questions d'hydrographie — les autres réunions de comités se tenant de leur côté. Il est proposé qu'une décision soit prise à la prochaine réunion du Comité au sujet de plans définis pour l'organisation future des Réunions Scientifiques. Il est aussi proposé que le sujet principal de discussion pour la Réunion Biologique de 1934 soit celui qui est suggéré par le Comité du Plancton, soit: l'influence de la lumière sur le développement et les mouvements du plancton.

2. Protection du Poisson.

Le Comité recommande au Conseil que les Recommandations 1 et 2 du Comité Baltique concernant l'établissement de mesures protectives pour le flet et le saumon soient portées à la connaissance des Gouvernements en question pour leur prise en considération.

Le Comité ayant examiné les conclusions de la Réunion Scientifique Biologique (voir ci-dessous) recommande l'adoption par le Conseil des Recommandations suivantes:

a) Le Conseil International recommande que les divers Gouvernements engagent l'industrie chalutière dans les pays intéressés à entreprendre des expériences à l'aide de

---

Conclusions de la Réunion Scientifique Biologique.

I. La biologie du Hareng et les pêcheries du hareng des divers pays ont été soumises à une étude intensive et on a obtenu ainsi une connaissance intime de la biologie de ce poisson et de la composition de ses groupements, en point de vue de l'âge, du sexe, de la maturité et de l'origine. En outre, on a pris en sérieuse considération la capture des jeunes harengs en Norvège, en Grande Bretagne, en Hollande et en Allemagne de même que la pêche au chalut des harengs. Dans l'état actuel de nos connaissances il est permis de déclarer pour les mers de l'Europe septentrionale — sauf la Baltique, pour laquelle notre information est encore insuffisante — que:

les méthodes et l'extension actuelle de la capture des jeunes harengs n'entraîne pas de dommage appréciable pour le stock, ni — par conséquent — pour le produit des pêche.

II. La Réunion, se basant sur les études et les investigations du Conseil sur l'Eglefin arrive à la conclusion que la capture des jeunes classes de l'églefin a pris actuellement une extension extrêmement fâcheuse au point de vue de la conservation du stock et qu'on pourrait épargner considérablement ces jeunes classes par l'emploi de chaluts à mailles plus larges.

of enlarged mesh, on board of commercial trawlers, and under the usual conditions of the commercial fishery.

b) The International Council recommends a continued survey of the stock of Plaice in the North Sea, and especially of the capture of small undersized plaice: so that the Council may be in a position to recommend effective measures of protection, if at any time altered conditions should endanger the situation.

3. Organisation of Committee Work.

The Committee having considered the report from the Chairman of the Plankton Committee (see App. 2), made at the request of the Council (see Vol. LXXIV, p. 38) submitted to and accepted by the Bureau, recommended the continuance of the Plankton Committee and recommended also that this Committee should fix its own programme as to the investigations to be undertaken and the methods to be employed.

The Committee accepted the recommendation of the Combined Meeting of the Salmon and Trout Committee and the Baltic Committee that all questions affecting salmon and trout and other anadromous fishes should be referred to and dealt with by the Salmon and Trout Committee, and that the preparation of resolutions for international conventions for distinct areas should be in the hands of the appropriate Area Committee.

After considering the memorandum submitted by the Combined Meeting of the Transition and Baltic Committees (see p. 60) the Consultative Committee recommended that no alteration be made in the present arrangement: e. g. that the two Committees remain under separate Chairmen.

4. Reports of Committees.

The following reports of Committees were presented by the Chairmen of the Committees concerned, and were passed by the Consultative Committee:—

North Eastern Area Committee	North Western Area Committee.
Atlantic Slope Committee.	Combined North Sea Committee.
Northern North Sea Committee.	Southern North Sea Committee.
Transition Area Committee.	Baltic Committee.

III. It is the considered opinion of the Meeting that investigation of the stock of Plaice in the Southern North Sea has shown that an unrestricted fishery, especially on the so-called Nursery Grounds, is a danger to the maintenance of the marketable stock, and is likely to be followed by a diminution of the yield.

The size-limits, close-times and closed areas, formerly recommended by the International Council, were meant to guard against this danger. But a change has lately occurred in the state of affairs, in that steam-trawlers now keep off the nursery grounds, and the fishery is mainly carried out there by motorcutters using the Danish seine and subject to a size-limit. It appears that the saving of the stock of plaice resulting from this change is sufficient for the present: provided that no new dangers arise, such as might come (for instance) from an increased demand for small undersized plaice for the fishmeal factories, or for other purposes.

chaluts à mailles agrandies, à bord de chalutiers de commerce, et dans les conditions habituelles de la pêcherie commerciale.

b) Le Conseil International recommande une inspection continue du stock de Plie dans la Mer du Nord, et spécialement celle de la capture de la jeune plie de taille inférieure, afin que le Conseil puisse se trouver à même de recommander des mesures effectives si à un moment donné un changement des conditions rendait la situation périlleuse.

3. Organisation du Travail des Comités.

Le Comité ayant pris connaissance du rapport du Président du Comité du Plancton (voir Appendice 2) élaboré à la demande du Conseil (voir Vol. LXXIV, p. 39), soumis au Bureau et accepté par lui, recommande le maintien du Comité du Plancton et suggère que ce Comité détermine lui-même le programme des investigations à entreprendre et les méthodes à employer.

Le Comité accepte la recommandation de la réunion combinée du Comité du Saumon et de la Truite et du Comité Baltique, à savoir: que toutes les questions concernant le saumon, la truite et les autres poissons anadromes soient transmises au Comité du Saumon et de la Truite et traitées par lui, et que la préparation de résolutions en vue de conventions internationales pour des aires déterminées soit confiées aux Comités des Secteurs que la chose concerne.

Ayant examiné le mémorandum présenté par la Réunion Combinée du Comité du Secteur de Transition et du Comité Baltique (voir p. 61) le Comité Consultatif recommande qu'il ne soit rien changé à la disposition actuelle, c'ést-à-dire que soient maintenus deux Comités avec Présidents séparés.

4. Rapports de Comités.

Les rapports suivants ont été présentés par les Présidents des Comités et sont agréés par le Comité Consultatif:

Comité du Secteur Nord-Est
Comité du Plateau Continental Atlantique
Comité du Nord de la Mer du Nord
Comité du Secteur de Transition
Comité du Secteur Nord-Ouest
Comité Combiné de la Mer du Nord
Comité du Sud de la Mer du Nord
Comité Baltique

III. L'avis mûrement pesé de la Réunion est que les investigations sur le stock de Plie dans le sud de la Mer du Nord ont montré qu'une pêcherie sans restriction, spécialement sur les fonds appelés "Nurseries", constitue un danger pour la conservation du stock de marché et qu'elle aura probablement pour conséquence une diminution du rendement.

Les tailles minima, la fermeture de certaines époques, la clôture de certaines aires, recommandées précédemment par le Conseil International, avaient pour but de parer à ce danger. Cependant il s'est produit récemment un changement dans l'état des choses, du fait que les chalutiers à vapeur se tiennent maintenant au large des nurseries et que la pêche sur celles-ci se fait principalement par des cotres à moteur employant la seine danoise et soumis à une taille minima. Il semble que l'épargne du stock de plie résultant de ce changement est suffisante pour le moment, pourvu qu'il ne se produise pas de nouveaux dangers tels, par exemple, que celui qui pourrait provenir d'une augmentation de la demande de la petite plie inférieure à la taille minima pour les usines de farine de poissons ou pour d'autres buts.

Combined Transition Area and Baltic Committees.
Hydrographical Committee. Plankton Committee.
Statistical Committee. Salmon and Trout Committee.
Combined Salmon and Trout and Baltic Committees.
Whaling Committee.

The Committee agreed to the following proposals involving expenditure:—

North Western Area Committee (II, 2) Combined North Sea Committee (II, 1)
Hydrographical Committee (II, 1 & 2) Plankton Committee (II, 1 & 2).

Appendix 1.

Proposals by the Sub-Committee for the Scientific Meetings.

A. The question of annual or biennial Scientific Meetings.

I) The Sub-Committee's proposals are based on the following considerations:
1) The scientific meetings have proved to be of great value; they ought therefore to be continued.
2) It has been found to be a drawback that the biological and the hydrographical scientific meetings are held simultaneously, so that the biologists cannot attend the hydrographic meetings nor the hydrographers the biological meetings, though they wish to attend and their attendance is desirable in the interests of full discussion.

II) There are two possibilities for simplifying the annual sessions and for meeting the objection expressed in I, par. 2:—
1) That only one scientific meeting be held each year, alternately a biological and a hydrographical.
2) That scientific meetings be held every second year only (at long sessions) while in the intermediate years the work of the Council be limited to Committee discussions only (short sessions).

We recommend the second suggestion.

III) If the principle of biennial long sessions be adopted it will have to be decided whether both biological and hydrographical scientific meetings should be held at every long session or whether they should alternate. In the last case, biological and hydrographical scientific meetings respectively would only be held every fourth year, which would mean too long intervals between the meetings.

We therefore recommend for the long sessions that two scientific meetings be held, one biological and one hydrographical, and that they be held at different hours.

Whether the meetings should occupy a full day or whether half a day may be considered enough will have to be decided in each individual case.

It is recommended that the Scientific Meetings should be held early in the Council's proceedings.

Comité Combiné de la Baltique et du Secteur de Transition
Comité Hydrographique
Comité du Plancton
Comité Statistique
Comité du Saumon et de la Truite
Comité Combiné du Saumon et de la Truite et de la Baltique
Comité de la Baleine

Le Comité agrée les propositions suivantes qui comportent des dépenses:

Comité du Secteur Nord-Ouest (II, 2)
Comité Hydrographique (II, 1 & 2)
Comité Combiné de la Mer du Nord (II,1)
Comité du Plancton (II, 1 & 2)

Appendice 1.

Propositions du Sous-comité des Réunions Scientifiques.

A. Question des Réunions Scientifiques annuelles ou bisannuelles.

I) Les propositions du Sous-Comité sont basées sur les considérations suivantes:

1. Les réunions scientifiques se sont montré être d'une grande valeur; elles doivent donc être continuées.
2. Il a été reconnu qu'il y a un inconvénient à la tenue simultanée des réunions scientifiques biologiques et hydrographiques: les biologistes ne peuvent pas assister aux réunions hydrographiques ni les hydrographes aux réunions biologiques bien qu'ils en aient le désir et que leur présence soit désirable dans l'intérêt des discussions complètes.

II) Il y a deux manières possibles de simplifier les sessions annuelles et de répondre à l'objection exprimée en I, par. 2:

1) Qu'on ne tienne chaque année qu'une seule réunion scientifique qui serait alternativement biologique et hydrographique.
2) Que les réunions scientifiques ne soient tenues que tous les deux ans (longues sessions) tandis que dans les années intermédiaires les travaux du Conseil se borneraient à des discussions de Comités (courtes sessions).

Nous recommandons la seconde proposition.

III. Si le principe des longues sessions bisannuelles est adopté, il faudra décider si les réunions scientifiques biologiques et hydrographiques seront toutes deux tenues à chacune des longues sessions ou si elles alterneront. Dans le dernier cas chacune des réunions scientifiques, l'une biologique et l'autre hydrographique, respectivement, ne serait tenue que tous les quatre ans, ce qui entraînerait de trop longs intervalles entre les réunions.

Nous recommandons donc qu'au cours des longues sessions on tienne deux réunions scientifiques, l'une biologique et l'autre hydrographique et qu'elles soient fixées à des heures différentes.

Il faudra décider dans chaque cas si les réunions devront occuper un jour entier ou si une demi-journée pourra suffire.

Il est recommandé que les Réunions Scientifiques se tiennent au début des opérations du Conseil.

IV) If it should be necessary to discuss a special hydrographical question at the short sessions it is suggested that this could be done at a supplementary meeting of the Hydrographical Committee.

B. Proposals for the proceedings with regard to the next Scientific Meetings.

1) In preparing the Scientific Meetings special experts from countries interested in the particular questions should be requested to deliver full reports in writing on the themes to be discussed at the meeting.
2) Such reports will be printed as proof-prints and distributed in the usual form. This distribution shall, if possible, take place one year before or in no case later than during the month of December before the next year's meeting.
3) The Bureau appoint, when possible, a year before the respective meeting a reporter and a co-reporter, and if it is necessary a translator for each question.
4) Based on the printed reports and their own observations during the scientific meetings the reporters should give a verbal résumé of the questions and present to the gathering the papers on which the discussion is based.

The reporter and the co-reporter should agree between themselves how they will divide the material. The papers should be printed and handed to the participants in the meeting at least two months before.

5) The object of the discussion is primarily to discuss the main theses of the reporters' papers. It is urgently desirable that experts who have delivered written reports should take part in the discussion. The content of their papers can be taken as read and need not be given in detail at the meeting.

Appendix 2.

Memorandum on the work of the Plankton Committee.

By

Prof. H. H. Gran.

1) It may be presumed that the scientists working with plankton will in future work each confine himself to his special problems, and that the collecting of material after a common plan and the printing of plankton bulletins can be abandoned.

2) On the other hand, it is highly desirable that the Plankton Committee should continue its work for the following reasons:—

A) It is very important that the plankton specialists should have opportunities of meeting regularly to report their results and discuss their methods and problems. The individual workers in a line so specialised as the plankton research are very liable to suffer from isolation, and such informal meetings would highly stimulate their activity.

B) Improving and standardising of methods will still be necessary, as the

IV. S'il était nécessaire qu'un point spécial d'hydrographie soit discuté au cours des courtes sessions, il est suggéré que cela pourrait se faire dans une réunion supplémentaire du Comité hydrographique.

B. Propositions de mesures en vue des prochaines Réunions Scientifiques.

1) En vue de la préparation des Réunions Scientifiques il sera demandé aux experts speciaux des pays intéressés dans les questions particulières, de remettre des rapports écrits complets sur les matières à discuter dans la réunion.
2) Ces rapports seront imprimés et distribués à l'état d'épreuves, dans la forme habituelle. Cette distribution se fera, autant que possible, un an avant la réunion mais en aucun cas plus tard que pendant le mois de Décembre précédent.
3) Le Bureau nommera, autant que possible, un an avant chaque réunion, un rapporteur et un co-rapporteur, et si c'est nécessaire, un traducteur pour chaque question.
4) Les rapporteurs se basant sur les rapports imprimés et sur leurs propres observations faites au cours des réunions scientifiques, devront donner un résumé verbal des questions et présenter à l'assemblée les publications sur lesquelles la discussion est basée.

   Le rapporteur et le co-rapporteur devront se mettre d'accord pour le partage du matériel. Les travaux devront être imprimés et transmis aux participants de la réunion au moins deux mois à l'avance.
5) L'objet de la discussion doit avant tout porter sur les principales thèses du mémoire du rapporteur. Il est vivement à désirer que les experts qui ont remis des rapports écrits prennent part à la discussion. Le contenu des mémoires pourra être considéré comme ayant été lu et il ne sera pas nécessaire d'en exposer le détail à la réunion.

Appendice 2.

Mémorandum sur le travail du Comité du Plancton.

Par

Prof. H. H. Gran.

1) On peut penser que, dans l'avenir, les travailleurs individuels s'occupant du plancton s'appliqueront chacun à leurs problèmes particuliers et que la réunion de matériaux d'après un plan commun peut être abandonnée ainsi que l'impression de bulletins de plancton.
2) D'autre part, il est hautement désirable que le Comité du Plancton continue son travail pour les raisons suivantes:
   A) Il est très important que les spécialistes en plancton aient l'occasion de se réunir régulièrement pour se faire part de leurs résultats et discuter leurs méthodes et leurs problèmes. Les travailleurs individuels engagés dans une direction aussi spécialisée que les recherches planctoniques sont exposés à souffrir de l'isolement et de telles réunions sans formalité stimuleront vivement leur activité.
   B) Le perfectionnement et la standardisation des méthodes resteront nécessaires au

research proceeds. The comparative investigation regarding the catching capacity of different types of nets under the direction of Professor MIELCK was very useful. The improvement and standardisation of methods to determine phosphates, nitrates and ammonia in sea water worked out by specialists (BUCH, HARVEY, SCHREIBER, WATTENBERG) at the conference in Oslo, 1928, has established the foundation of a new epoch in the science of marine biology, and similar progress may be expected from the conference on carbonic acid in Helsingfors, 1931. For 1933 or later a general conference on the light question with reports by specialists has been planned. If possible this conference should be succeeded by a special conference of selected scientists to compare the methods and adapt them for special biological purposes. The Plankton Committee will from the experiences of the individual members be qualified to raise other questions to be taken up in future.

C) Questions may arise which the scientists of one country have no opportunity to solve with their own resources alone. If they could make their colleagues of some other countries sufficiently interested in the problem, it might be attacked and solved by joint collaboration. I was very thankful for the collaboration which, in the spring of 1912, gave me the opportunity to try my method for quantitative plankton determination over a wider area than could be reached from my own country. Just now we have reached a point, where an extended investigation of the circulation of nitrates and phosphates in combination with a research regarding the growth of the plankton in the North Atlantic would be very promising, and it is my intention to take up the question for a preliminary discussion at the meeting in June. Perhaps a collaboration might also be recommended to study the influence of the Baltic water on the plankton production of the Kattegat and the Skagerrack, with special reference to the question as to whether the rich production in the Kattegat is stimulated by an outflow of nutritive substances from the Baltic. I mention these cases as examples, other scientists may suggest other questions to be solved by collaboration.

cours du progrès des recherches. Les investigations comparatives sur le pouvoir de capture des divers types de filets, sous la direction du Prof. Mielck ont été très utiles. Le perfectionnement et la standardisation des méthodes de dosage des phosphates, des nitrates et de l'ammoniaque dans l'eau de mer, obtenus par des spécialistes (Buch, Harvey, Schreiber, Wattenberg) à la conférence d'Oslo, en 1928, ont ouvert une nouvelle ère dans la science de la biologie marine et on peut attendre un progrès semblable de la conférence de l'acide carbonique d'Helsingfors, 1931. Une nouvelle conférence générale sur la question de la lumière, avec rapports de spécialistes, est projetée pour l'année 1933 ou pour plus tard. Si possible, cette conférence serait suivie d'une conférence spéciale de travailleurs choisis, pour comparer les méthodes et pour les adapter aux nécessités spéciales de la biologie. Le Comité du Plancton, grâce aux expériences de certains de ses membres, sera qualifié pour soulever d'autres questions à entamer dans l'avenir.

C) Il peut se présenter des questions que les chercheurs d'un pays donné n'ont pas l'occasion de résoudre par leurs seules ressources. S'ils pouvaient intéresser suffisamment leurs collègues d'autres pays à leurs problèmes, ceux-ci pourraient être abordés et résolus grâce à une collaboration confiante. J'ai été très reconnaissant pour la collaboration qui m'a donné au printemps de 1912 l'occasion d'éprouver ma méthode de détermination quantitative du plancton sur une aire plus étendue que celle que j'aurais pu atteindre dans mon propre pays. Actuellement nous sommes arrivés à un point où une investigation étendue sur la circulation des nitrates et des phosphates combinée avec une recherche sur le développement du plancton dans l'Atlantique Nord promettrait beaucoup, et j'ai l'intention d'entamer la question en vue d'une discussion préliminaire à la réunion de juin. On pourrait peut-être recommander aussi une collaboration pour l'étude de l'influence de l'eau Baltique sur la production de plancton dans le Cattégat et le Skagerak en attachant une attention spéciale à la question de savoir si la riche production du Cattégat est stimulée par une sortie de substances nutritives de la Baltique. Je mentionne ces cas comme exemples, d'autres investigateurs ont peut-être d'autres questions à résoudre par collaboration.

Programmes and Reports of Area Committees.

North Eastern Area Committee.

Chairman: Prof. JOHAN HJORT.
Vice-Chairman: Mr. OSCAR SUND.
The Committee met at 2.30 p.m. on June 21st, 1932.

I. Proceedings.

1) The Vice-Chairman reported on the work done in 1931 referring to the different sections of the Administrative Report, copies of which were distributed.
2) Mr. SUND informed the Committee that the Norwegian Fisheries Directorate hoped to be able to continue the different lines of research to the same extent as in the last years and that in addition a closer investigation would be made of the sexual maturity of the cod in different seasons and areas. Collection of otoliths had been commenced, for the purpose of improving the knowledge of the age of the cod. Mr. SUND pointed out, however, that the sizes alone were the essential data from a fishery point of view and the age-determination must in any case be regarded only as another means to the same end, namely the forecasting of yields and size of fish.
3) Mr. SUND explained the necessity for obtaining material from the open sea through non-Norwegian agencies, and the resolution given below was adopted.
4) A short discussion ensued on the zero point for fish measurements which is different in Norway from the other countries and it was apparent that no change could be made.
5) Prof. HJORT and Mr. SUND were re-elected Chairman and Vice-Chairman for the ensuing year.

II. Recommendation.

Owing to the difficulty of interpreting market material it is recommended that observations, especially of cod, should be carried out at sea at Bear Island and the Barents Sea grounds.

North Western Area Committee.

Chairman: Prof. JOHS. SCHMIDT.
The Committee met on June 23rd, 1932 at 2.30 p.m.

I. Proceedings.

1) The Administrative Report for 1931 was adopted.
2) The Chairman made the following communications:—
   a) On new plaice marking experiments at Iceland. The recapture percentage has increased very much.

Programmes et Rapports des Comités des Secteurs.

Comité du Secteur Nord-Est.

Président: Professeur Johan Hjort.
Vice-Président: M. Oscar Sund.
Le Comité se réunit à 2h30 p.m. le 21 juin 1932.

I. Compte rendu.

1) Le Vice-Président fait son rapport sur le travail exécuté en 1931, et passe en revue les différentes sections du Rapport Administratif, dont les exemplaires ont été distribués.
2) M. Sund fait connaître au Comité que la Direction des Pêcheries de Norvège espère pouvoir continuer les différentes séries de recherches comme les années précédentes et, en outre, poursuivre de plus près une investigation sur la maturité sexuelle du cabillaud dans des aires diverses et pendant différentes saisons. Des collections d'otolithes ont été commencées en vue d'améliorer la connaissance de l'âge du cabillaud. M. Sund fait remarquer, cependant, que la donnée des tailles seule est essentielle au point de vue de la pêcherie et qu'en tout cas la détermination de l'âge ne doit être considérée que comme un autre moyen tendant au même but, à savoir, la prévision du rendement et de la taille du poisson.
3) M. Sund explique qu'il est nécessaire d'obtenir du matériel de haute mer en recourant à des interventions non-Norvégiennes, et la recommandation ci-dessous est adoptée.
4) Une courte discussion s'ouvre ensuite sur le point zéro de la mesure du poisson lequel est différent, en Norvège, de celui des autres pays, et il semble s'établir qu'on ne saurait y apporter aucun changement.
5) Le Professeur Hjort et M. Sund sont réélus Président et Vice-Président pour l'année suivante.

II. Recommandation.

Etant donnée la difficulté de l'interprétation du matériel de marché il est recommandé que des observations, à l'Ile des Ours et dans la Mer de Barents, soient faites en mer —, surtout concernant le cabillaud.

Comité du Secteur Nord-Ouest.

Président: Professeur Johs. Schmidt.
Le Comité se réunit le 23 juin 1932 à 2h30 p.m.

I. Compte rendu.

1) Le Rapport Administratif pour 1931 est adopté.
2) Le Président fait les communications suivantes:
   a) Sur de nouvelles expériences de marquage de la plie, en Islande. Le pourcentage des recaptures est fortement augmenté.

b) On cod marking experiments at the Faroes, at Iceland and at Greenland during the last 6 years, especially showing an important interchange between the Iceland and Greenland cod populations.

c) On pelagic work showing the drift of cod larvae from Iceland to East Greenland. He added that much more work had to be done before the question of the Greenland cod would be solved. He considered South West Iceland as a spawning area corresponding to the west coast of Norway. Messrs. RUUD, SUND and LE DANOIS communicated on certain problems of the cod in the North Western Area.

d) On continued trawling experiments inside and outside the territorial waters of Iceland.

e) On continued racial investigations on Cod.

f) Preliminary statement of the work done in the Central Atlantic in co-operation with Dr. BIGELOW (working in the research vessel "Atlantis") on eel larvae and hydrographical conditions.

The Chairman further referred to a paper by Dr. TÅNING on otolith investigations of Iceland cod and fluctuations.

Furthermore hydrographical work in connection with biological work in the Faroe-Shetland Channel had been carried out by the "Dana" in June 1932.

3) Programme of work. It was decided to continue the work on the same lines.

4) Prof. SCHMIDT was re-elected Chairman of the Committee.

II. Recommendations.

1) In view of the different fishing methods and areas worked by the fleets of the different nations frequenting the waters of the North Eastern and North Western Areas it is considered indispensable in order to form a correct picture of the fish populations on which the several fisheries are based, that all the participating nations should institute regular measuring of unsorted catches.

In order to save money and labour and in the interest of unbiassed measuring the D'ARCY THOMPSON millimeter paper method is recommended.

The investigators responsible for this kind of research in the several countries should communicate with one another so as to obtain the best possible covering of time and areas and to prevent unnecessary overlapping.

2) It was recommended that the Bureau should be asked to publish a report for the three years following the last Report.

b) Sur des expériences de marquage du cabillaud aux Färoe, en Islande et au Groenland pendant les 6 dernières années; elles établissent qu'il se produit un échange important entre les populations de cabillaud de l'Islande et du Groenland.

c) Sur le travail pélagique montrant la dérive des larves de cabillaud de l'Islande au Groenland oriental. Le Prof. Schmidt ajoute qu'il faudra encore beaucoup de travail pour obtenir la solution de la question du cabillaud du Groenland; il considère le Sud-Ouest de l'Islande comme une aire de ponte correspondant à la côte ouest de Norvège. MM. Ruud, Sund et le Danois font des communications au sujet de certaines questions relatives au cabillaud dans le secteur Nord-Ouest.

d) Sur la continuation d'expériences de chalutage en dedans et en dehors des eaux territoriales d'Islande.

e) Sur la continuation des recherches sur les races du cabillaud.

f) Communication préliminaire sur le travail exécuté dans l'Atlantique central en coopération avec le Dr. Bigelow (travaillant sur le navire de recherches "Atlantis") et concernant les larves d'anguille et les conditions hydrographiques.

Le Président signale un travail du Dr. Tåning sur les otolithes du cabillaud d'Islande et sur ses fluctuations.

D'ailleurs un travail hydrographique conjointement avec du travail biologique dans le canal Färoe-Shetland a été exécuté par le "Dana" en juin 1932.

3) Programme de travail. Il est décidé de conserver les mêmes lignes de travail.

4) Le Professeur Schmidt est réélu Président du Comité.

II. Recommandations.

1) Il est recommandé, que toutes les Nations participantes instituent des mensurations régulières sur des captures non triées. En effet, c'est considéré comme indispensable afin que l'on puisse se représenter exactement les populations de poissons sur lesquelles sont basées les pêcheries qu'exercent, par des méthodes différentes et dans des eaux diverses, les Nations fréquentant les eaux des secteurs Nord-Est et Nord-Ouest.

En vue d'épargner de l'argent et du travail et d'obtenir des mensurations de même ordre, la méthode au papier millimétré de D'Arcy Thompson est recommandée.

Les investigateurs chargés de ce genre de recherches dans les divers pays devraient communiquer entre eux afin d'obtenir la meilleure répartition possible dans le temps et dans l'espace et d'éviter les empiétements inutiles.

2) Il est recommandé de demander au Bureau de publier un rapport sur les trois années qui suivent le dernier rapport.

Atlantic Slope Committee.

Chairman: Dr. Ed. le Danois.
Vice-Chairman: Prof. Rafael de Buen.
The Committee met at 9.30 a.m. on June 22nd, 1932.

I. Proceedings.

1) The Chairman welcomed Admiral Tito de Morais, Professor Schulz and Professor Fage.
2) The Chairman read the Administrative Report which was adopted by the Committee.
3) Professor le Gall gave an account of the bathymetrical, hydrological, lithological, and biological observations which he had made according to the recommendation of the Committee II, 8 (1931) and pointed out the analogies of the herring trawling grounds in the Smalls, Klondyke and Fladen areas.
4) Mr. Belloc outlined the technique for the marking of hake which he and Mr. Hickling had employed on board the "George Bligh" in August 1931 during a cruise in which he had been able to take part owing to an invitation from the British Ministry of Fisheries. He stated that one of the 78 marked hake had been recaptured 9 months after liberation.
5) On behalf of Mr. Hickling Dr. Russell confirmed the previous outline and stated that the marking of hake would be continued this year on board the "George Bligh".
6) Dr. Russell delivered a note from Mr. Hickling concerning the commercial size of the hake according to Rec. II, 12 (1931).
7) Dr. Ramalho outlined the results of his investigations on the Portuguese sardine. These investigations had been executed according to the decision taken at the Meeting of Experts in Lisbon in September 1930. They considered specially the types of boats and gear used in the sardine fishery, the quantities fished, their composition etc. The report hereon would be printed in the Rapport Atlantique.

   Dr. Ramalho said that histological studies of ovaries were now in progress,
8) Mr. Belloc gave — in accordance with the same decisions from the conference at Lisbon — a résumé of the conclusions of a report on the sardine between Loire and Gironde. This Report is in print in the "Revue des Travaux de l'Office français des Pêches".
9) Prof. Hjort compared the researches made by the Committee on the sardine with those which have been made on the herring and dealt with the importance, from a general biological point of view, of stating the relation between the lengths of the different ages according to the various latitudes and of studying the variations of this relation through the progress of years.
10) Prof. Rafael de Buen reported on the work of the Spanish Laboratory of the Canaries and on the results of the hydrological and meteorological investigations made in 1931.
11) The Committee discussed the application of the refractometrical method for the determination of salinity and asked Prof. Rafael de Buen to bring forward this question in the Hydrographical Committee.
12) The Chairman gave an account of the meeting held at Madrid and Cadiz in June 1932

Comité du Plateau Continental Atlantique.

Président: Dr. Ed. le Danois.
Vice-Président: Prof. Rafael de Buen.
Le Comité se réunit le 22 juin 1932 à 9h30 a.m.

I. Compte rendu.

1) Le Président souhaite la bienvenue à M. l'Amiral Tito de Morais, à M. le Prof. Schulz et à M. le Prof. Fage.
2) Le Président donne lecture du rapport administratif qui est approuvé par le Comité.
3) M. le Gall rend compte des observations bathymétriques, hydrologiques, lithologiques et biologiques qu'il a effectuées conformément à la recommandation du Comité II, 8, (1931) et montre les analogies des fonds de chalutage du hareng aux Smalls, au Klondyke et au Fladen.
4) M. Belloc expose la technique de marquage du merlu qu'il a adoptée avec M. Hickling, à bord du "George Bligh" en août 1931 pendant la croisière à laquelle il a pu prendre part grâce à l'invitation du Service des Pêches d'Angleterre. Il signale qu'un des 78 merlus marqués a été recapturé, neuf mois après la libération.

5) Dr. Russell confirme de la part de Mr. Hickling le précédent exposé, et indique que le marquage des merlus sera continué cette année à bord du "George Bligh".
6) Dr. Russell remet une note de Mr. Hickling sur la taille marchande du merlu conformément à la recommandation II, 12 (1931).
7) Dr. Ramalho expose les résultats de ses travaux sur la sardine portugaise. Ces travaux sont l'exécution de décisions prises à la conférence d'Experts tenue à Lisbonne en septembre 1930. Ils portent notamment sur les types des bateaux et d'engins employés à la pêche de la sardine, les quantités pêchées, leur composition etc. Ce rapport sera imprimé dans le Rapport Atlantique 1931.

   Le Dr. Ramalho rend compte que des études d'histologie ovarienne sont actuellement poursuivies.

8) M. Belloc, conformément aux mêmes décisions de la conférence de Lisbonne, résume les conclusions d'un travail sur la sardine entre Loire et Gironde. Ce mémoire est en cours de publication dans la Revue des Travaux de l'Office français des Pêches.
9) Le Prof. Hjort compare les études effectuées sur la sardine par le Comité et celles qui ont été faites sur le hareng, et fait une communication sur l'importance que peut présenter au point de vue de la biologie générale l'établissement du rapport entre les longueurs aux différents âges suivant les diverses latitudes et l'étude des variations de ce rapport suivant les années.
10) Le Prof. Rafael de Buen signale le fonctionnement du laboratoire espagnol des Canaries et les résultats des études hydrologiques et météorologiques en 1931.
11) Le Comité discute l'application de la méthode réfractométrique à la détermination de la salinité et prie M. Rafael de Buen d'exposer cette question devant le Comité hydrographique.
12) Le Président rend compte de la réunion tenue à Madrid et à Cadix en juin 1932 pour

for the determination of the research methods to be applied to the tunny family. He read the minutes of this meeting and the recommendations attached to them. The latter were adopted by the Committee with the exception of recommendation B. The minutes of the conference will be printed in the Rapport Atlantique for 1931.

The Committee presented its thanks to the Spanish Government for the hospitality offered to the experts.

13) The programme of work given below was discussed by the Committee.

14) The Committee desired that Messrs. Defant, Hjort and Schmidt be nominated members of the Committee.

15) Messrs. le Danois and Rafael de Buen were re-elected as Chairman and Vice-Chairman for the ensuing year.

Programme of work.

1) For the purpose of continuing the study of the hydrographical and biological conditions in the Bay of Biscay periodical quarterly cruises will be made by the Governments of France, Spain and the Irish Free State, the cruises being as follows:—

Spain:	8° W. from the coast to 47° N.
	6° W. from the coast to 44°30′ N.
	Along 43° N. from the coast to 10° W.
France:	From Ushant to 9° W. (49° N.).
	9° W. from 49° N. to 47° N.
	From 47° N. (9° W.) to Ushant.
Ireland:	8° W. from the coast to 49° N.
	49° N. between 8° and 9° W.
	9° W. from 49° N. to the coast of Ireland.

These cruises will be undertaken during the months of February, May, August and November.

During each cruise deep sea observations will be made at one or more stations off the Atlantic Slope, if possible from the surface to the bottom. The cruises will be utilized for plankton observations.

2) The study of the western Channel will be undertaken by Great Britain, by means of periodical cruises with the Marine Biological Association's vessel.

3) The Irish Free State will undertake cruises to the south-west of Ireland to determine the position of the 35.5 $^0/_{00}$ isohaline. Cruises with regard to hydrology and plankton will be made to the fishing grounds of the Klondyke and to the coasts of Ireland and Scotland.

4) The investigations of the Committee in the waters of the Canaries will be continued by the new Spanish laboratory in these islands.

5) The investigations in the Bay and the Straits of Gibraltar will be continued by Spain and Portugal.

la détermination des méthodes d'études applicables à la famille des Thonnidés. Il donne lecture du protocole de cette réunion et des vœux attachés à ce protocole. Ceux-ci sont adoptés par le Comité à l'exception du vœu B. Le compte rendu de cette conférence sera publié dans le Rapport Atlantique 1931.

Le Comité adresse ses remerciements au Gouvernement Espagnol pour l'hospitalité qu'il a offerte aux experts.

13) Le programme de travail pour l'année suivante est discuté par le Comité.

14) Le Comité demande que MM. Defant, Hjort et Schmidt soient compris parmi ses membres.

15) MM. le Danois et Rafael de Buen sont réélus comme Président et Vice-Président pour l'année suivante.

Programme de travaux.

1) En vue de continuer l'étude des conditions hydrographiques et biologiques du Golfe de Gascogne, des croisières périodiques trimestrielles seront effectuées par les gouvernements de la France, de l'Espagne et de l'Etat Libre d'Irlande, dans les conditions suivantes:

Espagne:	8° W. G. de la côte jusqu'au 47° N.
	6° W. G. de la côte jusqu'au 44°30′ N.
	le long du 43° N. de la côte jusqu'au 10° W. G.
France:	d'Ouessant au 9° W. G. (49° N.)
	9° W. G. du 49° N. au 47° N.
	du 47° N. (9° W.) à Ouessant.
Irlande:	8° W. G. de la côte au 49° N.
	49° N. entre 8° et 9° W. G.
	9° W. G. du 49° N. à la côte d'Irlande.

Ces croisières seront effectuées aux mois de février, mai, août et novembre.

A chaque sortie, une ou plusieurs stations comprendront des observations en eau profonde; si possible de la surface au fond, en dehors du Plateau continental. Les sorties seront utilisées pour des pêches planctoniques.

2) L'étude de la Manche Occidentale sera faite par les soins de la Grande-Bretagne sous forme de croisières périodiques, exécutées par le navire de la "Marine Biological Association".

3) L'Etat Libre d'Irlande exécutera des croisières au Sud-Ouest de cette île afin de préciser la position de la ligne isohaline 35,5 $^{0}/_{00}$. Des croisières seront effectuées au point de vue hydrologique et planctonique des fonds du Klondyke, aux côtes d'Irlande et d'Ecosse.

4) Les études du Comité dans la région des Canaries seront continuées par le nouveau laboratoire espagnol de ces îles.

5) Les études dans la baie et le détroit de Gibraltar seront continuées par l'Espagne et le Portugal.

6) The investigations in the Straits of Gibraltar will be made in relation to those of the Mediterranean Commission.

7a) The investigations on the tunny will be continued, applying the methods decided upon at the Cadiz meeting.

b) The investigations on the sardine will be continued, using the methods decided upon at the Lisbon meeting.

c) The investigations on the hake will be undertaken in the northern area by a Sub-Committee consisting of Messrs. Belloc (France), Farran (Ireland), Hickling (England), and in the southern area by Spanish and Portuguese (Dr. Ramalho) experts.

8) The study of the herring races will be continued in the research area of the Committee and especially on the Smalls and on the Klondyke grounds.

9a) Biological-statistical methods will be applied on a very large scale to all questions studied by the Committee as well as the determination of the relation between the different lengths at the same ages of the various species of fish according to latitude.

b) It is desirable that the hydrological observations be accompanied by biological observations, since certain species are characteristic of definite ranges of depth or of definite physico-chemical conditions.

10) Plankton studies will be undertaken during the various cruises in order to collect information on the plankton which forms the food of whales.

11) In order to facilitate the rapid distribution of information between the members of the Committee after each cruise the Committee recommends that the salinity be determined on board by a suitable physical method. Provisional lists will be circulated by each member of the Committee to his colleagues.

12) A study of the marketable size of fish will be undertaken by the Committee in the various countries, based upon the first sexual maturity of the bottom species, i.e. the hake, the flat fish etc. Reports and suggestions on this question will be furnished at the next Committee Meeting by Messrs. Hickling (Great Britain), le Danois (France), Odón and F. de Buen (Spain).

13) The descriptions of the Atlantic Fish Fauna will continue to be published by the International Council under the direction of Prof. Joubin on the present lines.

Combined North Sea and Eastern Channel Committee.

Chairman: Prof. G. Gilson.

The Committee met at 9.30 a.m. on June 22nd and at 11.30 a.m. on June 23rd, 1932.

I. Proceedings.

1) The Administrative Report of the Chairman was approved.

2) Prof. Gilson emphasised the necessity of promoting a collaboration between workers engaged in special researches in a particular region. Frequent intercourse should be

6) Les recherches dans le détroit de Gibraltar seront effectuées en accord avec celles de la Commission de la Méditerranée.

7a) Les études sur le thon seront continuées en appliquant la technique établie à la réunion de Cadix.

b) Les études sur les sardines seront continuées en appliquant la technique établie à la réunion de Lisbonne.

c) Les études sur le merlu seront effectuées dans le secteur nord par un sous-comité composé de MM. Belloc (France), Farran (Irlande), Hickling (Angleterre) et pour le secteur sud par des spécialistes espagnols et portugais (Dr. Ramalho).

Les expériences de marquage effectuées sur le "George Bligh" seront continuées.

8) Les études des races de hareng seront continuées dans le zone d'études du Comité et en particulier sur les fonds des Smalls et du Klondyke.

9a) La méthode des statistiques biologiques sera appliquée dans une très large mesure à toute question étudiée par le Comité ainsi que la détermination du rapport entre les différentes longueurs aux mêmes âges des diverses espèces de poissons suivant les latitudes.

9b) Il est désirable que les observations hydrologiques soient accompagnées d'observations biologiques étant donné que certaines espèces sont caractéristiques de niveaux déterminés ou de conditions physicochimiques précises.

10) Des études planctoniques seront effectuées au cours des diverses sorties en vue de recueillir des renseignements sur le plancton servant de nourriture aux cétacés.

11) En vue de faciliter le service d'information rapide entre les membres du Comité après chaque sortie des navires le Comité recommande la détermination de la salinité à bord par une méthode physique appropriée. Des listes provisoires seront adressée par chaque membre du Comité à ses collègues.

12) Une étude sur la taille marchande des poissons scra entreprise par le Comité dans les différents Etats, en se basant sur la première maturité sexuelle des espèces de fond, notamment du merlu, des poissons plats etc. Des rapports et suggestions seront fournis à la prochaine réunion du Comité sur cettte question par MM. Hickling (Grande Bretagne), le Danois (France), Odón et F. de Buen (Espagne).

13) Les fiches faunistiques continueront à être éditées par le Conseil International sous la direction de M. le Professeur Joubin, dans les conditions actuelles.

Comité Combiné de la Mer du Nord et de la Manche Orientale.

Président: Professeur G. Gilson.

Le Comité se réunit le 22 juin 1932 à 9h30 a.m. et le 23 juin à 11h30 a.m.

I. Compte rendu.

1) Le Rapport Administratif du Président est approuvé.

2) Le Prof. Gilson insiste sur la nécessité d'établir une association entre les travailleurs occupés à des recherches spéciales dans une région donnée. Il faut faciliter les relations

facilitated in order to obtain a rational and practical organisation of the details of the work and to reduce useless repetitions and loss of time and of means of action.

The proposal of the Chairman as to meetings of workers engaged in researches carried out in a given region, Recommendation II, 1 was adopted.

3) The question of organising an international intelligence service in favour of the fishery industry was proposed by Prof. Gilson and discussed. In this connection a scheme for collecting data concerning the herrings landed in all important fishery ports was brought forward by Mr. Davis who proposed that these data should be sent to Lowestoft with scales mounted according to the standard method and rapidly examined at the Fisheries Laboratory. The results of their analysis should be communicated to other laboratories and these, eventually, to the fishing industry.

A Sub-committee composed of Dr. Lissner, Dr. Russell and Dr. Bowman was appointed to examine the matter; they presented the following report:—

"The Sub-committee is of opinion that it is not the function of the Council to collect and distribute commercial information. Further, the fact that the collection and dissemination of precise information would involve the setting up of a special staff and would entail expense, leads the Sub-committee to think that, under existing conditions, the proposal is impracticable. It may also be pointed out that the function of collecting and disseminating information is already carried out by trade organisations and trade journals.

The principle of exchange of scientific data of immediate general interest and importance is approved, but the Sub-committee feel that, for the moment, this is better attained by close personal contact between experts rather than by formal exchange of data either direct or through a central service".

The report of the Sub-Committee was adopted.

4) In reply to a communication from the Chairman of the Hydrographical Committee a letter was addressed to that Committee to the effect that the Combined North Sea and Eastern Channel Committee considered that the continuation of the advance proofs of the Bulletin Hydrographique was desirable.

5) Mr. Davis presented a report of the Sub-Committee for the study of saving gears, including the recommendation II, 2, which the Committee agreed.

6) Prof. Gilson was re-elected Chairman of the Committee for the ensuing year.

II. Recommendations.

1) That a sum of money be reserved by the Bureau to pay the travelling expenses of members eventually called to meet for working purposes on board of research ships or in Laboratories, at times and places presently undetermined, in the southern North Sea or Eastern Channel: Lowestoft, Boulogne, Ostend, Ymuiden or other places. The funds to be obtained from the Administrative Secretary, on application of the Chairman of the Committee.

2) The Committee, being of the opinion that experiments carried out on research vessels

en vue de l'organisation rationnelle et pratique des détails du travail et de réduire les répétitions inutiles et les pertes de temps et de moyens d'action.

La proposition du Président au sujet des réunions de travailleurs engagés dans des recherches particulières conduites dans une région donnée, Recommandation II, 1, est adoptée.

3) La question de l'organisation d'un service international d'information en faveur de l'industrie de la pêche proposée par le Prof. Gilson, est discutée. A ce sujet un projet de réunion de données concernant les harengs débarqués dans tous les ports de pêche importants est présenté par M. Davis. Il propose que ces données soient envoyées à Lowestoft avec des écailles montées suivant la méthode standardisée et qui seraient rapidement examinées au Laboratoire des Pêcheries. Les résultats de leur analyse seraient communiqués à d'autres laboratoires et, éventuellement, à l'industrie de la pêche.

Un sous-comité composé des Dr. Lissner, Dr. Russell et Dr. Bowman est nommé pour l'examen de cette question. Le sous-comité présente le rapport suivant:

"Le sous-comité est d'avis qu'il n'entre pas dans la fonction du Conseil de réunir et de répartir des informations commerciales. En outre, le fait que la réunion et la diffusion d'informations précises nécessiterait la création d'un personnel spécial et entraînerait des dépenses, conduit le Sous-comité à penser que, dans les conditions actuelles, la proposition est impraticable. On peut aussi faire remarquer que la réunion et la distribution des informations est déjà assumée par les organisations commerciales et les journaux commerciaux.

Le principe de l'échange de données scientifiques d'un intérêt général immédiat est approuvé, mais le Sous-comité est d'avis que, pour le moment, ce but est mieux atteint par un contact personnel étroit entre experts, plutôt que par un échange officiel de données, qu'il soit direct ou exercé par un service central".

Le rapport du Sous-comité est adopté.

4) En réponse à une communication du Président du Comité Hydrographique, une lettre est adressée à ce Comité, lui faisant savoir que le Comité Combiné de la Mer du Nord et de la Manche orientale considère comme désirable la continuation de l'envoi en avance des épreuves du Bulletin Hydrographique.

5) M. Davis présente un rapport du Sous-comité pour l'étude des engins épargneurs, comprenant la recommandation II, 2 qui est agréée par le Comité.

6) Le Prof. Gilson est réélu Président du Comité pour l'année suivante.

II. Recommandations.

1) Qu'une somme d'argent soit réservée par le Bureau pour payer les frais de voyage des membres qui seraient éventuellement appelés à se réunir, pour des travaux à bord des navires de recherche ou dans les laboratoires à des moments et en des endroits actuellement indeterminés, dans le Sud de la Mer du Nord ou de la Manche orientale: Lowestoft, Boulogne, Ostende, Ymuiden, ou ailleurs. Les fonds seront obtenus du Secrétaire Administratif, sur la demande du Président du Comité.

2) Le Comité étant d'avis que les expériences effectuées à bord des navires de recherche,

with the ordinary fishing gear and with saving gears on the relation of sizes of mesh have now served their purpose, recommend that their place should be taken by experiments on commercial vessels using cod-ends fitted with meshes made on spools of not less than 10 cms. circumference if made of double trawl manilla, or 8—9 cms. if made of lighter single material.

It is desired and contemplated that selected vessels should carry cod-ends of the mesh recommended and carry out, over a long period, alternate hauls, or series of hauls, with these and normal nets, careful records being kept of the several trade categories taken by each net.

In connection with this recommendation the Committee feel that it cannot be too strongly stressed that, before regulations can be imposed or recommendations made as to mesh, a commercial test is essential. There is no reason to believe that the Industry itself would not undertake these tests. Whether fishing gear experiments are carried out on commercial or research vessels, it is of the utmost importance to have full information as to what size of mesh is involved with nets produced on given spools, when different materials are used.

Northern North Sea Committee.

Chairman: Dr. A. Bowman.

The Committee met at 10.30 a. m. on June 22nd, 1932.

I. Proceedings.

1) The Chairman in referring to the Administrative Report drew attention to the extensive work being carried on in Scotland with regard to haddock and plaice. He suggested an extension of the programme of setting out of drift bottles, in order to link up hydrographical observations in areas where these are not continuous.

2) Short résumés were given by M. H. Wood, Dr. Lissner and Prof. Ehrenbaum of the herring investigations carried on by Scotland and Germany in the Northern North Sea. The results of the work carried on by both countries on herring races were in substantial agreement. Significant differences in body variates were established between the spring spawning and autumn spawning herring of the Northern North Sea and adjacent areas.

3) The following programme for the ensuing year was adopted. The "Dana "on the return journey from Iceland in August will make hydrographical and trawling observations between Shetland and the Great Fisher Bank, and means will be taken to collaborate by Norway, employing the "Johan Hjort" and by Scotland employing the "Explorer".

sur l'influence relative des diverses grandeurs de mailles, avec les engins ordinaires et avec les filets épargneurs, ont maintenant atteint leur but, recommande qu'elles soient remplacées par des expériences faites à bord de navires commerciaux employant des arrière-fonds (codends) à mailles faites sur un moule ne donnant pas moins de 10 centimètres de circonférence en double manille de chalut ou de 8 à 9 cms en fil simple plus léger.

Il est désiré et espéré que des navires choisis puissent emporter des arrières-fonds à mailles de la grandeur recommandée, et exécuter, pendant une longue période, des pêches ou des séries de pêches alternativement avec ces filets et avec leur filet normal en tenant soigneusement compte des diverses catégories commerciales capturées par chacun de ces engins.

Au sujet de cette recommandation le Comité estime qu'on ne saurait faire remarquer avec assez d'insistance qu'il est essentiel qu'une épreuve commerciale soit faite avant qu'on puisse imposer des réglementations ou faire des recommandations au sujet des mailles. Il n'y a pas lieu de penser que l'industrie elle-même ne pourra pas entreprendre ces essais. Que les expériences avec des engins de pêche se fassent sur des navires de recherches ou de commerce, il est de la plus haute importance d'obtenir des renseignements complets au sujet de la grandeur des mailles que l'on obtient pour des filets fabriqués sur des moules donnés, avec des matériaux textiles différents.

Comité du Nord de la Mer du Nord.

Président: Dr. A. Bowman.
Le Comité se réunit à 10h30 a.m. le 22 juin 1932.

I. Compte rendu.

1) Le Président, en traitant du Rapport Administratif, attire l'attention sur le travail très étendu qui est exécuté en Ecosse au sujet de l'églefin et de la plie. Il propose d'étendre encore le programme de la mise à flot de bouteilles de dérive, afin de relier entre elles les observations hydrographiques dans les aires où ces observations ne sont pas continues.
2) De courts résumés sont présentés par M. H. Wood, le Dr. Lissner et le Prof. Ehrenbaum au sujet des investigations sur le hareng poursuivies par l'Ecosse et par l'Allemagne dans le Nord de la Mer du Nord. Les résultats du travail exécuté par ces deux pays sur les races du hareng sont essentiellement d'accord. Des différences corporelles significatives sont établies entre les harengs à ponte printanière et à ponte automnale de la Mer du Nord et des aires adjacentes.
3) Le programme suivant est adopté pour l'année suivante: Le "Dana", dans son voyage de retour d'Islande, en Août, fera des observations hydrographiques et des recherches de chalutage entre les Shetlands et le Great Fisher Bank, et des mesures en vue d'y collaborer seront prises par la Norvège avec le "Johan Hjort" et par l'Ecosse avec l'"Explorer".

Hydrographical sections and sampling of herring shoals are contemplated by Holland. Sampling of herring shoals and hydrographical observations will be undertaken by France and Germany. Scotland will continue her programme of general investigations in the area.

4) Dr. Bowman was re-elected Chairman for the ensuing year.

II. Recommendation.

That the analysis of the herring shoals in the Northern Area be continued in accordance with the proposals made at Lowestoft in November 1930.

Southern North Sea Committee.

Chairman: Prof. W. Mielck.

The Committee met on June 23rd, 1932, at 9.30 a.m.

I. Proceedings.

1) The Administrative Report was adopted.
2) It was resolved that no scientific communication should be made verbally at the sessions of the Committee. Any scientific communication shall be put in writing and circulated to the members of the Committee, through the Chairman, not later than the first day of the international meeting. This procedure was carried out, as far as possible, during the present session.
3) The following scientific papers had been circulated to the members of the Committee and were discussed: —
   a) D. E. Thursby-Pelham: Memo on a Scheme for Co-operative work in the measurements of market categories of North Sea Plaice, landed by all countries.
   b) F. M. Davis: Report on the Results of Experiments on Savings Gear.
   c) W. C. Hodgson: On the Comparison between the Herrings of the Dogger Bank and those of the Humber Area.
   d) H. Lissner: Die Heringe aus der Region der Doggerbank im Jahre 1931.
   e) R. E. Savage: Report on the trials with various types of gear for capturing Herring Larvae.
   f) W. Mielck: Über zum Fang von Heringslarven geeignete Geräte.
   g) A. Bückmann: Untersuchung der Ursachen der Fluktuationen.
4) The following investigations on the size composition of market categories of North Sea plaice are contemplated in accordance with the suggestions issued by Miss Thursby-Pelham, or have already been carried out.

   Belgium: Prof. Gilson will be prepared to undertake the required measurements if the necessary financial assistance is granted by his government.

   Denmark: Measurements of market categories will be undertaken as soon as possible at Esbjerg (the only place where categories are distinguished) at selected seasons.

La Hollande se propose d'exécuter des sections hydrographiques et des échantillonages de bancs de hareng. La France et l'Allemagne entreprendront des échantillonages de bancs de hareng et des observations hydrographiques. L'Ecosse poursuivra son programme général d'investigation dans le secteur.

4) Le Dr. Bowman est réélu Président pour l'année suivante.

II. Recommandations.

Il est recommandé que l'analyse des bancs de harengs dans le secteur du Nord se poursuive conformément aux propositions faites à Lowestoft en Novembre 1930.

Comité du Sud de la Mer du Nord.

Président: Professeur W. Mielck.
Le Comité se réunit le 23 juin 1932 à 9h30 a.m.

I. Compte rendu.

1) Le Rapport Administratif est adopté.
2) Il est décidé qu'aucune communication scientifique ne sera faite verbalement au cours des sessions du Comité. Toute communication scientifique devra être faite par écrit et distribuée aux membres du Comité, par le Président, au plus tard le premier jour de la réunion internationale. Cette procédure a été suivie autant que possible pendant la présente session.
3) Les communications scientifiques suivantes ont été distribuées aux membres du Comité et discutées:
   a) D. E. Thursby-Pelham: Memorandum au sujet d'un projet de travail coopératif de mensuration des catégories commerciales de la plie de la Mer du Nord débarquée dans tous les pays.
   b) F. M. Davis: Rapport sur les résultats des recherches sur les engins épargneurs.
   c) W. C. Hodgson: Sur la comparaison des harengs du Dogger Bank avec ceux de la région de l'Humber.
   d) H. Lissner: Les harengs de la région du Doggerbank en l'année 1931.
   e) R. E. Savage: Rapport sur les essais faits avec divers types d'engins pour la capture des larves de harengs.
   f) W. Mielck: Sur des engins pour la capture des larves de harengs.
   g) A. Bückmann: Recherches sur les causes des fluctuations.
4) Les investigations suivantes sur la composition des catégories de marché de la plie de la Mer du Nord sont projetées, conformément aux suggestions de Miss Thursby-Pelham, ou bien ont déjà été réalisées.

   Belgique: Le Prof. Gilson sera prêt à entreprendre les mensurations demandées, si l'assistance nécessaire est accordée par son Gouvernement.

   Danemark: Des mensurations de catégories de marché seront entreprises, aussitôt que possible, à Esbjerg (le seul endroit où des catégories de marché sont distinguées), en certaines saisons.

Germany: In connection with the age investigations on plaice landed, measurements of the size categories have been made, and the results of these will soon be published. A continuous record of the cutter catches will be kept.

Holland: The quantities of the market categories landed were published recently in the official report on fisheries. Measurements of the plaice landed have been made weekly since January 1932.

It was resolved that the forthcoming data should be handed to the Lowestoft Fisheries Laboratory for combined treatment as soon as available.

5) The recommendations made by Mr. Davis in his paper on the "Results of experiments on Savings Gear etc." were adopted by the Committee (see Recommendation).

6) As regards collaboration in investigation of the frequency and distribution of herring larvae in the season October 1932—March 1933, the following work is contemplated by the different countries:

Belgium: Weekly plankton samples and hydrographical investigations on a section Deal — Gravelines.

Denmark: The distribution and frequency of herring larvae will, if possible, be investigated on a cruise of the "Dana" in April 1933.

England: Collections will be made of winter spawned larvae in the vicinity of the Straits of Dover.

France: Collections of plankton samples will be made during the winter spawning season at Sandettie L. V. and along the east coast of the Channel.

Germany: A cruise of "Poseidon" will take place in late autumn in the Southern North Sea. Also the arrival of the different shoals of larvae in the inner part of the German Bight will be investigated and likewise on a spring cruise of "Poseidon" the distribution of larvae and transformation stages.

It was resolved that the results of these investigations should be communicated to this Committee at its next session.

7) It was recommended that in the investigations of the Herring larvae where numerous larvae are present, especially where the very young stages are concerned, vertical hauls should be taken with Hensen's Egg Net, Petersen's young fish trawl being used if the population of larvae is scarce and mostly composed of larger specimen, the single hauls not to exceed the duration of, say, 10 minutes. Further it was recommended that investigations be made on the efficiency of oblique hauls with Petersen's young fish trawl and on the vertical distribution of larvae by day and by night.

8) As regards the apparent connection between the abundance of year classes of plaice and certain meteorological and hydrographical factors, the Committee considers that a close survey of these correlations is highly desirable.

9) Prof. Mielck was re-elected Chairman for the ensuing year.

Allemagne: Des mensurations des catégories de taille ont été faites en conjointement avec les recherches sur l'âge de la plie débarquée, et leurs résultats seront bientôt publiés. Il sera tenu une comptabilité suivie de la capture des côtres.

Hollande: Les quantités des catégories de marché débarquées ont été publiées récemment dans le rapport officiel sur les pêcheries. Des mensurations de la plie débarquée ont été faites chaque semaine depuis janvier 1932.

Il est décidé que les données obtenues seront passées au laboratoire des Pêcheries de Lowestoft pour y être soumises à un traitement en combinaison dès qu'elles seront disponibles.

5) Les recommandations proposées par M. Davis dans son travail sur les résultats des expériences sur les engins épargneurs etc. sont adoptées par le Comité (voir: II. Recommandation).

6) En ce qui concerne la collaboration pour les investigations sur la fréquence et la distribution des larves de hareng pendant la saison d'octobre 1932 à mars 1933, le travail suivant est proposé par divers pays:

Belgique: Des échantillons de plancton et des observations hydrographiques seront pris hebdomadairement sur la ligne Deal-Gravelines.

Danemark: La distribution et la fréquence des larves de hareng sera, si possible, étudiée au cours d'une croisière du "Dana" en avril 1933.

Angleterre: Des collections de larves nées en hiver seront faites au voisinage du Pas de Calais.

France: Des collections d'échantillons de plancton seront faites pendant la saison de ponte d'hiver au bateau-phare Sandettie et le long de la côte orientale de la Manche.

Allemagne: Une croisière du "Poseidon" sera faite à la fin de l'automne dans le Sud de la Mer du Nord. En outre l'arrivée de différents bancs de larves sera épiée dans la partie intérieure de la Baie Allemande et, au cours d'une croisière de printemps du "Poseidon" on étudiera la distribution et les stades de transformation des larves.

Il est décidé que les résultats de ces investigations seront communiqués au Comité dans la prochaine session.

7) Il est recommandé que dans les investigations, là où les larves de hareng et spécialement les stades jeunes, se présentent en grand nombre, il soit fait des pêches verticales avec l'"Egg net" de Hensen, le chalut à jeunes poissons de Petersen n'étant employé que si la population des larves est clairsemée et formée principalement d'individus de grande taille, la durée des pêches particulières ne devant pas excéder 10 minutes. En outre, il est recommandé que des investigations soient faites sur l'efficacité des pêches obliques à l'aide du chalut à jeunes poissons de Petersen, ainsi que sur la distribution des larves pendant le jour et pendant la nuit.

8) Au sujet d'une relation apparente entre l'abondance des classes annuelles de la plie et certains facteurs météorologiques et hydrographiques le Comité estime qu'une recherche minutieuse sur ces corrélations est hautement désirable.

9) Le Prof. Mielck est réélu Président pour l'année suivante.

II. Recommendation.

A recommendation was made as to future investigations with saving gear (especially cod-end meshes) and this is embodied in the protocol of the Combined North Sea and Eastern Channel Committee (Rec. 2).

Transition Area Committee.

Acting-Chairman: Dr. H. Blegvad.
The Committee met at 10.30 a. m. on June 23rd, 1932.

Proceedings.

1) The Acting Chairman opened the meeting and referred to the loss of the late Chairman, Dr. A. C. Johansen.
2) Plaice: Dr. Blegvad spoke on the Danish transplantations from the North Sea to the Belt Sea in the years 1928 to 1932.

   Dr. K. A. Andersson, Dr. Strodtmann and Dr. Fischer expressed the strong interest which these transplantations had for their respective countries.
3) Haddock: Dr. K. A. Andersson gave a communication on the Swedish investigations in the Skagerak and the Cattegat concerning the distribution of the youngest year-classes in later years. Dr. Strodtmann and Dr. Poulsen took part in the discussion.
4) Herring: Dr. K. A. Andersson reported on the investigations of the racial characters of the Cattegat herring. He proposed a co-operation between Denmark and Sweden. Dr. Blegvad stated that Denmark would participate in such co-operative investigations.
5) Sprat: Dr. Molander reported on sprat-investigations on the west coast of Sweden. Mr. Asserson and Dr. Strodtmann stated that their respective countries were interested in these investigations.
6) Periodic variations: Mr. Aage Jensen addressed the Committee on periodic variations in stocks of fish and fisheries in the Transition Area.
7) Cod: Dr. Blegvad gave a short communication on an experimental transplantation of cod from the Cattegat to the Limfjord. Mr. Asserson mentioned the rearing experiments in Norway.
8) The members of the Committee who are greatly interested in the transplantation of plaice from the North Sea to the Belt Sea expressed the wish that a comprehensive report of these successful Danish experiments should be issued as soon as possible. A plan for co-operative work between Denmark, Germany and Sweden concerning plaice transplantations is to be worked out.
9) It was decided to continue and extend the investigations of herring races. Special stress will be laid upon the study of the places and times of spawning of the different types of herring as well as on the distribution of the larvae.
10) It was decided to continue and extend to the Belt Sea the sprat investigations in the Cattegat and the Skagerak.

II. Recommandation.

Une recommandation est faite au sujet des investigations futures sur les engins épargneurs (spécialement sur les mailles de l'arrière-fond (cod-end)) et celle-ci est incluse dans le protocole du Comité Combiné de la Mer du Nord et de la Manche Orientale (Rec. 2).

Comité du Secteur de Transition.

Faisant fonction de Président: Dr. H. Blegvad.
Le Comité se réunit le 23 juin 1932 à 10h30 a.m.

I. Compte rendu.

1) Le Président intérimaire ouvre la séance et rappelle la perte du Président défunt le Dr. A. C. Johansen.
2) Plie: Le Dr. Blegvad parle des transplantations du Danemark de la Mer du Nord dans les Belts pendant les années 1928 à 1932.
   Le Dr. K. A. Andersson, le Dr. Strodtmann et le Dr. Fischer font ressortir le grand intérêt de ces transplantations pour leurs pays respectifs.
3) Eglefin: Le Dr. K. A. Andersson présente une communication sur les recherches de la Suède dans le Skagerak et le Cattégat au sujet de la distribution des plus jeunes classes d'âge dans ces dernières années. Le Dr. Strodtmann et le Dr. Poulsen prennent part à la discussion.
4) Hareng: Le Dr. K. A. Andersson fait un rapport sur les investigations sur les caractères de races du hareng du Cattégat. Il propose une collaboration entre le Danemark et la Suède. Le Dr. Blegvad déclare que le Danemark participerait à ces recherches coopératives.
5) Esprot: Le Dr. Molander fait rapport sur les investigations concernant l'esprot sur la côte de la Suède. Mr. Asserson et le Dr. Strodtmann déclarent que leurs pays respectifs sont intéressés par ces investigations.
6) Variations périodiques: M. Aage Jensen entretient le Comité des variations périodiques des stocks de poissons et des pêcheries dans le secteur de Transition.
7) Cabillaud: Le Dr. Blegvad présente une courte communication sur la transplantation expérimentale du cabillaud du Cattégat dans le Limfjord. M. Asserson signale les expériences d'élevage en Norvège.
8) Les membres du Comité qui prennent un grand intérêt à la transplantation de la plie de la Mer du Nord dans la Mer des Belts expriment le désir de voir publier le plus tôt possible un rapport étendu sur les expériences danoises si réussies. Un plan de coopération entre le Danemark, l'Allemagne et la Suède, pour la transplantation de la plie, doit être élaboré.
9) Il est décidé de continuer et d'étendre les investigations sur les races du hareng. Une attention particulière sera attachée à l'étude des lieux et des époques de ponte des divers types de hareng ainsi qu'à la distribution des larves.
10) Il est décidé de continuer et d'étendre à la Mer des Belts les investigations sur l'esprot du Cattégat et du Skagerak.

11) It was agreed that the biology of the dab especially in the southern Belt Sea should be subjected to a close study.
12) It was decided to continue the investigations on the races of cod and plaice.
13) Dr. Blegvad was elected Chairman of the Committee.

Baltic Committee.

Chairman: Dr. K. A. Andersson.
The Committee met on June 22nd 1932 at 10.30 a. m.

I. Proceedings.

1) The Administrative Report was adopted.
2) Flounder: The scientific report concerning the general results of the investigations on the Baltic flounder was circulated.

The authors gave short résumés of their special report. On the basis of the report the desirability of measures for protecting the flounder in the Baltic was thoroughly discussed.

Dr. Fischer spoke on a race of flounder spawning in the Jasmunder Bodden.

3) Salmon: Dr. Andersson gave an account of the methods of the salmon fishery on the Swedish coast and of the analysis of catches. He also raised the question of an international minimum size for the salmon in the Baltic. This question was discussed by the representatives of the countries concerned.

Dr. Andersson introduced the suggestion of an international organisation for propagation of the salmon in the Baltic area.

4) Sprat: Prof. Siedlecki reported on a new method of the sprat fisheries and on the sprat investigations carried out on the Polish coast.
5) The Committee decided to continue the programme adopted in 1931, laying special stress upon the close observation of the effect of the measures for protecting the stock of plaice in the Baltic.
6) Concerning the flounder the following was unanimously agreed:—
   a) The investigations of all countries have established that the stock of flounders is composed of younger year-classes than formerly in gradually increasing proportion. The danger of an imminent crisis is to be feared.
   b) In order to avoid a serious decline in the fishery measures for the protection of the stock were adopted. (See Rec. II, 1).

   The countries concerned have to decide which of these measures are to be carried out.
7) Dr. Andersson was re-elected Chairman for the ensuing year.

II. Recommendations.

1) It was recommended for the protection of the stock of flounders:—
   a) A raising of the size limit.
   b) The introduction of a close season.
   c) The introduction of closed areas.

11) Il est décidé que la biologie du flet, surtout dans le sud de la Mer des Belts, sera soumise à une étude serrée.
12) Il est décidé de continuer les investigations sur les races du cabillaud et de la plie.
13) Le Dr. Blegvad est élu Président du Comité.

Comité Baltique.

Président Dr. K. A. Andersson.
Le Comité se réunit le 22 juin 1932 à 10h30 a.m.

I. Compte rendu.

1) Le Rapport Administratif est adopté.
2) Flet: Le rapport scientifique sur les résultats généraux des investigations sur le flet de la Baltique est distribué.

Les auteurs donnent un court résumé de leur rapport particulier. La désirabilité de mesures de protection pour le flet est discutée à fond sur la base du rapport.

Le Dr. Fischer parle d'une race de flet qui pond dans le Jasmunder Bodden.

3) Saumon: Le Dr. Andersson donne un apperçu sur les méthodes de la pêche du saumon sur la côte de la Suède et sur l'analyse des captures. Il soulève aussi la question d'une taille minima internationale pour le saumon dans la Baltique. Cette question est discutée par les représentants des pays qu'elle concerne.

Le Dr. Andersson suggère l'idée d'une organisation internationale pour la propagation du saumon dans la région Baltique.

4) Esprot: Le Prof. Siedlecki fait rapport sur une nouvelle méthode de pêche de l'esprot et sur les investigations concernant l'esprot à la côte de la Pologne.
5) Le Comité décide de continuer le programme adopté en 1931 et insiste spécialement sur l'étroite observation de l'effet produit par les mesures prises pour la protection du stock de plie dans la Baltique.
6) Au sujet du flet le Comité est unanimement d'accord sur les points suivants:.
   a) Les investigations de tous les pays ont établi que le stock des flets est composé de classes annuelles plus jeunes que précédemment et cela en proportion croissante. Le danger d'une crise est imminent.
   b) En vue d'éviter un sérieux déclin de la pêcherie, des mesures de protection du stock sont adoptées. (Voir II, Rec. 1).

      Les pays intéressés auront à décider quelles sont celles d'entre ces mesures qui doivent être appliquées.
7) Le Dr. Andersson est réélu Président pour l'année suivante.

II. Recommandations.

1) Sont recommandées pour la protection du stock de flet:
   a) Une élévation de la taille minima;
   b) L'introduction d'une saison close.
   c) L'introduction de la clôture de certaines aires.

2) That in order to protect and improve the stock of salmon an effective size limit for the salmon in the Baltic should be introduced.
3) That the Salmon and Sea Trout Committee should investigate the possibility of co-operation between the Baltic countries to improve the propagation of the salmon in the Baltic region.

Combined Baltic and Transition Area Committees.

Acting Chairman: Dr. K. A. Andersson.
The Committees met on June 21st, 1932 at 9.30 a.m.

Proceedings.

1) The Chairman opened the meeting and paid a tribute to the memory of the late Dr. A. C. Johansen.
2) Dr. E. M. Poulsen spoke on races and renewal of the stock of plaice in the Baltic.
3) Dr. Andersson reported on the marking experiments on the turbot in the southern Baltic.
4) At the request of the Consultative Committee the meeting gave the reasons for the maintenance of the two Committees. (See Appendix).

Appendix.

Reasons for the maintenance of the Transition Area Committee besides the Baltic Committee.

The members of the Baltic Committee and those of the Transition Area Committee are unanimous in believing that the hitherto prevailing division into two sections of the large area from the boundary between the North Sea and the Skagerrack to the Gulf of Bothnia has proved efficient and of great use to the work. It has also brought about results for commercial fishery: two conventions, for the fishery in the Baltic and for that in the Skagerrack and the Cattegat, are based on its work.

The hydrographical conditions and with them the life-conditions of the commercial fishes in the Skagerrack and the Cattegat on the one hand and in the Baltic proper on the other one differ entirely from one another. The composition also of the stock of commercial fishes is quite different in the Cattegat etc. from that in the Baltic proper. Consequently, each area has its own problems.

The Committee therefore consider that it is necessary to deal with the areas through two Committees.

In support of this conclusion, we append a review of the most important problems peculiar to each area as well as of the investigations to be made in common for both.

2) Il est recommandé qu'une taille minima efficace soit établie en vue de protéger et d'améliorer le stock du saumon dans la Baltique.
3) Il est recommandé que le Comité du Saumon et de la Truite examine la possibilité d'une coopération entre les pays Baltiques en vue d'améliorer la propagation du saumon dans la région Baltique.

Comités Combinés de la Baltique et du Secteur de Transition.

Faisant fonction de Président: Dr. K. A. Andersson.
Les Comités se réunissent le 21 juin 1932 à 9h30 a.m.

Compte rendu.

1) Le Président ouvre la séance et salue la mémoire du défunt Dr. A. C. Johansen.
2) Le Dr. E. M. Poulsen parle des races et du renouvellement du stock de la plie dans la Baltique.
3) Le Dr. Andersson fait un rapport sur les expériences de marquage du turbot dans la Baltique méridionale.
4) A la demande du Comité Consultatif, les Comités combinés formulent les raisons qu'il y a de maintenir deux Comités (Voir l'Appendice).

Appendice.

Motifs pour le maintien du Comité du Secteur de Transition en sus du Comité Baltique.

Les membres du Comité Baltique et du Comité du Secteur de Transition sont unanimement d'avis que la division actuelle de la grande région s'étendant de la limite entre la Mer du Nord et le Skagerak jusqu'au Golfe de Bothnie en deux secteurs est pratique et que cela s'est confirmé entièrement au point de vue du travail. Elle a même produit des résultats pratiques pour la Pêche: deux Conventions, l'une pour la pêche de la Baltique, l'autre pour celle du Skagerak et du Cattégat, reposent sur les travaux de ces Comités.

Les relations hydrographiques, et, par suite, les conditions biologiques des poissons utiles dans le Skagerak et le Cattégat, d'une part, et dans la Baltique proprement dite, de l'autre, sont complètement différentes. Aussi, la composition du stock d'animaux utiles du Cattégat etc. est elle entièrement différente de celle du stock de la Baltique propre. Des problèmes distincts se posent donc pour chacune des deux régions.

Les Comités maintiennent donc que l'étude de la région par deux Commissions distinctes est nécessaire.

Comme base de cet avis nous présentons ci-dessous un aperçu sur les problèmes spéciaux les plus importants pour chacune des deux régions ainsi que sur les recherches qui devraient être instituées d'un commun accord dans les deux à la fois.

A. Transition Area.

1) In the Transition Area there live many commercial fishes of great importance which are of no commercial importance in the Baltic or even do not occur there, i.e. sole, witch, coalfish, mackerel, *Pandalus*, lobster. We have already a series of special papers dealing with these fishes; further investigations are necessary.

2) With regard to the herring of the Skagerrack and the Cattegat, as also those of the Belt Sea, the conditions concerning race and migrations are extremely complicated and entirely different from the Baltic proper. It is the special task of the Transition Area Committee to elucidate these conditions.

3) The sprat is a very valuable fish in this area. Its biology is as yet very little known. Relevant investigations are very important on account of the extraordinary fluctuations occurring here specially. They have been started, but can give results only if they are adapted to the peculiarities of the area.

4) With regard to the plaice the conclusion of a convention between Denmark, Norway and Sweden is directly imminent. The effects of the resulting saving measures must be controlled by the Transition Area Committee. Further, the heavy decrease of the stock of plaice in the Transition Area, has given rise to the transplantation of North Sea plaice into this area for the improvement of the stock. This work, a special undertaking of the Transition Area Committee, must be carried out for some years to come, and to this end the practical co-operation of the countries bordering the area has been suggested.

5) The haddock does not occur in the Baltic proper; in the Skagerrack and Cattegat it is a commercial fish of great importance. Its occurrence in these areas and in the Belt Sea is of special interest because the fish immigrates, in its younger stages, chiefly from the North Sea. Several papers are available; investigations in progress relate specially to the immigration and the occurrence of the younger stages, and these investigations must be continued.

B. Baltic Area.

1) The flounder is of decided economic importance for the Baltic proper only A report has been written forming the basis for protective measures, possibly to be introduced in the near future (Rapp. & Proc.-Verb. Vol. LXXVIII). The effect of the size limits introduced as an effect of the international convention of the spring 1931 is controlled by the Baltic Committee.

2) The dab also is of the higher order of commercial value in the Baltic only. Its importance for the fishery has recently risen considerably. The elucidation of its biology has already been commenced and will occupy the Baltic Committee for some years to come.

3) The herring, though occurring in the whole of the Baltic, has developed a specially characterised variety, called "Strömling", from the east of Rügen up to the Gulf of Bothnia. Its biology differs in various aspects from that of the other herrings

A. Secteur de Transition.

1) Il y a dans le Secteur de Transition beaucoup d'animaux utiles, très importants, qui n'ont aucune valeur économique dans la Baltique ou qui y font complètement défaut, par exemple: la sole, la sole limande, le colin, le maquereau, le *Pandalus*, le homard. Il y a déjà une série de travaux spéciaux sur ces espèces, et des travaux ultérieurs sont nécessaires.
2) Pour le hareng du Skagerak et du Cattégat, ainsi que des Belts, la situation concernant les races et les migrations est extraordinairement compliquée et tout-à-fait différente de celle de la Baltique propre. C'est au Comité du Secteur de Transition qu'incombe la tâche de la débrouiller.
3) L'esprot est un poisson de grande valeur pour ce secteur. La biologie de l'esprot fréquentant la région est encore très peu étudiée. Les recherches y prennent une grande importance à cause des variations extraordinaires qui s'y produisent. Le travail est commencé mais il ne peut conduire à des résultats que par des recherches adaptées aux particularités de la région.
4) Pour la plie, la conclusion d'une convention entre le Danemark, la Norvège et la Suède est imminente. L'action des mesures de protection qu'elle doit introduire doit être surveillée par le Comité du Secteur de Transition. En outre, la forte diminution du stock de plies dans le Secteur de Transition a motivé une amélioration de la situation par la transplantation de plies de la mer du Nord dans la région. Ce travail est spécialement la tâche du Comité du Secteur de Transition. Il devra se poursuivre encore pendant plusieurs années et une coopération pratique des pays avoisinants est proposée à cet effet.
5) L'églefin qui ne se rencontre pas dans la Baltique propre, est un poisson très important pour le Skagerak et le Cattégat. Sa présence dans ces régions et dans les Belts offre un intérêt particulier parce qu'il y pénètre surtout à l'état de jeunes venant de la Mer du Nord. Il y a déjà plusieurs travaux; à présent on étudie surtout la pénétration et la présence des formes jeunes, et ces travaux doivent être poursuivis.

B. Secteur Baltique.

1) Le flet n'a une grande importance que pour la Baltique propre. Un rapport a été élaboré pour servir de base à des mesures de protection éventuelles dans un avenir prochain (Rapp. & Proc.-Verb. Vol. LXXVIII). L'efficacité de la taille minima déjà introduite au printemps de 1931 par la Convention internationale sera controlée par le Comité Baltique.
2) De même la barbue n'a une grande importance économique que dans la Baltique. Son importance pour la pêche s'est fortement accrue dans les dernières années. La mise au point de sa biologie est une tâche déjà abordée, mais elle occupera encore le Comité Baltique pendant plusieurs années.
3) Le hareng existe dans toute la Baltique; mais à l'est de Rügen jusqu'au Golfe de Bothnie on rencontre une forme particulière bien caractérisée qui s'appelle "strömling". Sa biologie s'écarte en différents points de celle des autres harengs, car il vit dans des conditions extérieures entièrement différentes. L'étude de ses conditions de

as it lives under quite different conditions. The investigation of its life is a special problem. We refer to the papers by Hessle; their continuation is a task for the Committee.

4) The sprat has lately acquired great importance for the fishery of the eastern part of the Baltic after the introduction of the herring otter trawl. Its life, its occurrence, the composition of the catches there are as yet very little known. Here is a special work for the Baltic Committee which will be of importance, particularly for the sprat fishery in the northern part of the eastern Baltic, and which must be carried out independently of the sprat investigations in the Cattegat.

5) The salmon question in the Baltic is so far advanced that proposals for further protective measures for this area have been suggested.

6) The prevention of the damage done by seals to the fishery is also a special problem of the eastern Baltic, since this damage has been felt specially from the Gulf of Bothnia to Rügen.

C. Both Areas.

Commercial fishes which are of importance for both areas and for which the problems are partly alike are for example plaice and cod. For the protection of the plaice in the western and southern Baltic a convention already exists; its effect must be controlled by the members of the Committee concerned with a view to the preservation or alteration of the measures. Furthermore, investigations are in progress on the origin of the plaice of the area and on its races. The continuation of the investigations hitherto carried out on the cod is also necessary.

A further problem common to both areas is the exploration of the food-animals, those living at the bottom as well as the plankton. The researches initiated have to be continued on a larger scale.

vie est un problème spécial. Nous renvoyons aux travaux de Hessle dont la continuation incombe à la Commission.

4) L'esprot, par suite de l'introduction du chalut à panneaux pour harengs dans la partie est de la Baltique, a pris dans ces dernières années une grande importance dans la pêche. Ses conditions de vie, sa rencontre, la composition des captures, y ont été très peu étudiées. C'est là pour le Comité Baltique une tâche particulière qui aura son importance pour la pêcherie de l'esprot dans la partie nord de la Baltique orientale et qui doit être conduite indépendammant des recherches sur l'esprot du Cattégat.
5) La question du saumon dans la Baltique s'est developpée au point que des propositions de nouvelles mesures protectives pour cette région ont été faites.
6) La prévention du dommage que les phoques causent à la pêche est aussi un problème spécial à la Baltique orientale, car ce dommage se remarque surtout depuis le golfe de Bothnie jusqu'à Rügen.

C. Les deux Secteurs.

En fait de poissons utiles importants pour les deux régions, il faut citer la plie et le cabillaud pour lesquels des problèmes en partie semblables se posent. Pour la protection de la plie dans la Baltique occidentale et méridionale, il existe déjà une convention dont l'efficacité sera étudiée par les membres intéressés du Comité, en vue soit du maintien intégral, soit de la modification des mesures établies. En outre on fera des recherches sur l'origine de la plie et sur ses races dans la région. La continuation des recherches sur le cabillaud faites jusqu'à ce jour est aussi nécessaire.

Enfin les recherches sur les animaux alimentaires habitant le fond ou faisant partie du plancton se font sur un espace commun. Les investigations commencées doivent prendre plus d'extension.

Programmes and Reports of other Committees.

Hydrographical Committee.

Chairman: Prof. Martin Knudsen.

The Committee met at 4 p.m. on June 20th and at 4.30 p.m. on June 22nd, 1932.

I. Proceedings.

1) At the request of the Chairman measures of economy for the Hydrographic Service were taken into consideration by a Sub-Committee consisting of Messrs. Knudsen, Carruthers, van Riel, Schulz and Witting. This Sub-Committee made a report (App. I) which was adopted by the Hydrographic Committee in the form given below as Recommendations 1 and 2.
2) A revision of the list of members of the Hydrographical Committee was suggested, and it was decided that Prof. Schulz should replace Prof. Schott, that Prof. Zeilon should act as member for Sweden and Mr. Matthews be added for England.
3) The deliberations of the Sub-Committee for the Polar Year (Messrs. Knudsen, van Everdingen and Witting) were reported to the Committee by the Chairman. Contemplated extensions of the investigations by the different countries were announced.
4) It was communicated to the Committee that the work of publishing hydrographical data in the Bulletin Hydrographique and their distribution as proof-prints had been continued as hitherto.
5) The progress of the work on temperature and salinity normals for the North Sea and the English Channel was reported. As a result of the consideration of this work by the special Sub-Committee concerned, and also by that appointed to suggest economies, it is considered possible that the atlas may be issued this year, whilst the time of issue of the relevant tables remains a matter for consideration at next year's meeting.
6) Prof. Schulz made a statement concerning the work done by the Sub-Committee consisting of Messrs. Schulz, Jacobsen, O. Pettersson and Witting dealing with submarine waves and stated that the Scientific Hydrographic Meeting of this conference of the Council would deal with the work carried out.
7) The Committee recommended that the σ_t-tables of Mr. Matthews be issued in the form agreed upon by the author and the Service Hydrographique.
8) The Committee received from Prof. Witting a report on the work on correlations between the different carbonic acid factors carried out by Dr. Buch and his colleagues, and expressed their deep interest in the work that had been done.
9) Prof. R. de Buen submitted a memorandum dealing with the refractometric and other methods for the rapid determination of salinity. The Committee decided that the Sub-Committee (Messrs. K. Buch, R. de Buen, Giral, Harvey, Lumby, Schulz and Wattenberg) should consider this memorandum and report to the Committee at the meeting in 1933. The wish expressed by Prof. van Everdingen and submitted

Programmes et Rapports des autres Comités.

Comité Hydrographique.

Président: Prof. Martin Knudsen.
Le Comité se réunit le 20 juin 1932 à 4 p.m. et le 22 juin à 4h30 p.m.

I. Compte rendu.

1) Sur la demande du Président des mesures d'économie pour le Service Hydrographique sont prises en considération par un Sous-comité composé de MM. Knudsen, Carruthers, van Riel, Schulz et Witting. Ce Sous-comité dépose un rapport (Appendice I) qui est adopté sous la forme indiquée ci-dessous, Recommandations 1 et 2.
2) Une révision de la liste des membres du Comité Hydrographique est suggérée et il est décidé que le Prof. Schulz remplacera le Prof. Schott, que le Prof. Zeilon aura qualité de membre pour la Suède et M. Matthews pour l'Angleterre.
3) Les délibérations du Sous-comité pour l'Année Polaire (MM. Knudsen, van Everdingen et Witting) sont rapportées au Comité par le Président. Des extensions projetées pour leurs investigations sont annoncées par les divers pays.

4) Il est communiqué au Comité que le travail de la publication des données hydrographiques et leur distribution sous forme d'épreuves imprimées a été continué jusqu'ici.

5) Le progrès du travail sur les normes de température et de salinité pour la Mer du Nord et la Manche est exposé. Comme résultat de l'examen de ce travail, par le Sous-comité spécial et aussi par celui qui a été nommé pour proposer des économies, il est considéré comme possible que l'atlas puisse être publié cette année, tandis que la fixation de l'époque de la publication des tables correspondantes est réservée pour la réunion de l'année prochaine.
6) Le Prof. Schulz fait une communication au sujet du travail effectué par le Sous-comité composé de MM. Schulz, Jacobsen, O. Pettersson et Witting, au sujet des vagues sous-marines, et annonce que la Réunion Scientifique Hydrographique de la présente conférence du Conseil traitera de ce travail.
7) Le Comité recommande que les tables de σ_t de M. Matthews soient publiées sous la forme agréée par l'auteur et par le Service Hydrographique.
8) Le Comité a reçu du Prof. Witting un rapport au sujet du travail sur les différents facteurs de la variation de l'acide carbonique exécuté par le Dr. Buch et ses collègues, et exprime le vif intérêt que les membres ont pris à ce travail.
9) Le Prof. R. de Buen soumet au Comité un mémorandum traitant de la réfractométrie et d'autres méthodes de détermination rapide de la salinité. Le Comité décide que le Sous-comité (MM. K. Buch, R. de Buen, Giral, Harvey, Lumby, Schulz et Wattenberg) examinera ce mémorandum et fera un rapport au Comité à la réunion de 1933. Il est pris note du voeu exprimé par le Prof. van Everdingen, présente

by Mr. VAN RIEL of having copies of the memorandum for circulation to the various members of the Maritime Meteorological Commission, of which he is the President, was noted.

10) The report from the Sub-Committee (Messrs. BOWMAN, R. de BUEN, LE DANOIS, JACOBSEN, LUMBY and SCHULZ) to consider drafting a pamphlet describing the different types of drift-bottles was laid before the Committee and accepted. (App. II).

11) The different countries presented their programmes for the coming year. Information was received from Mr. VAN RIEL on behalf of Prof. VAN EVERDINGEN concerning co-operation with the Maritime Meteorological Commission and specially their resolution regarding observations to be carried out by liners in the Atlantic. After hearing Prof. GILSON's communication regarding the weekly cruises from Deal to Gravelines the Committee passed the resolution II, 3.

12) An offer was received from Prof. DOODSON to continue his work on the material collected 1921—23 at Smith's Knoll, Varne and Horns Reef Light Vessels. In view of the present financial situation it was decided to take no action this year.

13) The Norwegian proposal concerning the acceptance of thermograph diagrams from liners and the publication of the same in the Bulletin Hydrographique was discussed, and it was left to Mr. SUND to consider the matter further with the Service Hydrographique.

14) As regards the question to be selected for the Scientific Hydrographic Meeting next year, Prof. KNUDSEN intimated that it had been suggested that Scientific Meetings should henceforth be held every second year only. He expressed the opinion that this would not suffice for the hydrographical experts, and that a yearly meeting occupying a whole day should be continued. This was agreed.

15) Mr. MATTHEWS proposed that sea water samples should be sent from time to time to Copenhagen from the various countries, for control analyses to be made at the Service Hydrographique. It was understood that this control would be executed against payment.

16) Prof. KNUDSEN was re-elected Chairman of the Committee.

II. Recommendations.

It is recommended:—

1) That the off-prints of the Bulletin Hydrographique be continued only in the case of the North Sea and English Channel material.

2) That the atlas of normal temperature and salinity charts be published this year, but that the decision as to the time of printing of the tables be postponed to next year.

3) That the investigations carried out weekly by Belgium along the line Deal-Gravelines should be supported by other countries undertaking the work as far as possible, should the Belgian work unfortunately suffer interruptions.

4) That each country send samples of water every year to Copenhagen for control

par M. van Riel et tendant à obtenir des exemplaires du mémorandum de M. R. de Buen pour les distribuer aux divers membres de la Commission Météorologique maritime dont il est le Président.

10) Le rapport du Sous-comité pour la préparation d'une brochure décrivant les différents types du flotteurs pour la dérive (MM. Bowman, R. de Buen, le Danois, Jacobsen, Lumby et Schulz) est présenté au Comité et accepté. (Appendice II).

11) Les divers pays présentent leur programme pour l'année prochaine. Une information est reçue de M. van Riel de la part du Prof. van Everdingen concernant une coopération avec la Commission Météorologique maritime et spécialement sa résolution au sujet des observations à faire par des bateaux routiers réguliers dans l'Atlantique. Après avoir entendu une communication du Prof. Gilson au sujet des croisières hebdomadaires entre Deal et Gravelines, le Comité adopte la résolution II, 3.

12) Il est reçu, du Prof. Doodson, une offre de continuer son travail sur le matériel recueilli en 1921—23 aux bateaux-phares du Smith's Knoll, du Varne et de Horns Reef. En considération de la situation financière actuelle, il est décidé de ne rien entreprendre cette année.

13) La proposition de la Norvège, d'accepter des diagrammes thermographiques fournis par les navires de lignes de navigation et de les publier dans le Bulletin Hydrographique est discutée et il est laissé à M. Sund d'examiner plus amplement la question avec le Service Hydrographique.

14) Au sujet de l'adoption d'une question pour la réunion Scientifique Hydrographique de l'année prochaine, le Prof. Knudsen fait remarquer qu'on a suggéré qu'à l'avenir ces réunions scientifiques ne soient plus tenues que tous les deux ans. Il exprime l'avis que cela ne suffirait pas pour les experts hydrographiques, et que la réunion annuelle occupant une journée entière devrait être continuée. Cet avis est agréé par le Comité.

15) M. Matthews propose que des échantillons d'eau de mer soient envoyées à Copenhague de temps en temps par les divers pays et que des analyses de contrôle soient faites au Service Hydrographique. Il est entendu que ce contrôle se ferait contre paiement.

16) Le Prof. Knudsen est réélu Président du Comité.

II. Recommandations.

Il est recommandé:

1) que les tirés-à-part du Bulletin Hydrographique ne soient continués que pour le matériel de la Mer du Nord et de la Manche.

2) que l'atlas de cartes des normales de température et de salinité soit publié cette année, mais que la décision au sujet de l'impression des tables soit remise à l'année prochaine.

3) que les observations hebdomadaires exécutées par la Belgique sur la ligne Deal-Gravelines soient reprises par d'autres pays qui entreprendraient le travail autant que possible si, par malheur, le travail Belge devait souffrir des interruptions.

4) que chaque pays envoie chaque année à Copenhague des échantillons d'eau à sou-

determinations of chlorine by a volumetric method against normal water by the Service Hydrographique.

Appendix I.

Sub-committee on Economies in the Service Hydrographique.

The Sub-Committee recommends the following measures of economy in hydrographical publications:—

Yearly Publications.

1) Off-prints of the Bulletin Hydrographique.
Economies should be made on the off-prints by issuing only those relating to North Sea and English Channel material, but even distribution in this abbreviated form should depend upon the wish of the biologists; the question has been referred to the Combined North Sea and Eastern Channel Committee. As is seen from the attached correspondence from that Committee, the retention of the Bulletin Hydrographique off-prints is strongly recommended.

2) Bulletin Hydrographique.
Many years' experience shows that hardly a single treatise on hydrography dealing with the areas within the Council's activities has appeared, in which extensive reference to the Bulletin Hydrographique has not been made. It would be easy to cite numerous papers in support of this statement. The preservation of the Bulletin is absolutely necessary, because it represents the only means of presenting the hydrographical material to scientific workers. It is considered possible to achieve the necessary economies if surface material elsewhere published be omitted, provided all possible improvements in manner of presentation be taken into account.

Extraordinary publications.

1) Atlas of normal Temperature and Salinity Charts.
The Sub-Committee is definitely of the opinion that the atlas of normal temperature and salinity charts should be published this year, but that it should be left to the Council Meeting next year to decide when the relevant tables should be printed.
2) Cattegat Material.
It will fall to the Council to publish only the actual observational material collected under the original approved plan of the investigations (see Vol. LXXIV, p. 68) and not the numerous additional observations. These, and all scientific papers arising from the researches as a whole, will be for the individual countries to deal with.

Correspondence between the Sub-Committee and the Combined North Sea and Eastern Channel Committee.

1) To the Combined North Sea and Eastern Channel Committee.

The Sub-Committee has felt it necessary to achieve some economy in connection with the issue of off-prints from the Bulletin Hydrographique. Since these were origi-

mettre, au Service Hydrographique, à des déterminations chlorimétriques de contrôle par la méthode volumétrique contre eau normale.

Appendice I.

Sous-comité des économies du Service Hydrographique.

Le Sous-comité recommande les mesures d'économie suivantes pour les publications hydrographiques:

Publications annuelles:

1) Tirés-à-part du Bulletin Hydrographique.

Des économies pourraient être réalisées sur les tirés-à-part en restreignant leur impression aux seuls matériaux de la Mer du Nord et de la Manche, mais leur distribution même sous cette forme abrégée est subordonnée au voeu des Biologistes. La question a été soumise au Comité Combiné de la Mer du Nord et de la Manche Orientale. Ainsi qu'on le voit dans la correspondance avec ce Comité, annexée ci-dessous, la continuation de la distribution des tirés-à-part du Bulletin Hydrographique est fortement recommandée.

2) Bulletin Hydrographique.

Il est établi, par l'expérience de nombreuses années, qu'il n'y a guère un seul travail d'hydrographie traitant des aires d'activité du Conseil qui ne contienne d'importantes références au Bulletin Hydrographique. On pourrait aisément citer de nombreux travaux à l'appui de cette constatation. Le maintien du Bulletin est absolument nécessaire parcequ'il constitue le seul moyen de présenter le matériel hydrographique aux investigateurs scientifiques. On estime cependant possible de réaliser les économies nécessaires, en omettant les matériaux de surface publiés ailleurs, pourvu que tous les perfectionnements possibles du mode de présentation soient pris en considération.

Publications extraordinaires.

1) Atlas de Cartes des Normales de Températures et de Salinité.

Le Sous-comité est définitivement d'avis que l'atlas de cartes des normales de température et de salinité soit publié cette année, mais qu'il soit laissé à la Réunion du Conseil de l'année prochaine de décider quand les tables devront être imprimées.

2) Materiel du Cattegat.

Il incombera au Conseil de publier le seul matériel d'observations recueilli d'après le plan original approuvé des investigations (voir vol. LXXIV p. 69), et non les nombreuses observations additionelles. Il incomberait aux divers pays individuellement de publier celles-ci, ainsi que les travaux scientifiques ressortant de l'ensemble des recherches.

Correspondance entre le Sous-comité et le Comité Combiné de la Mer du Nord et de la Manche Orientale.

1) Au Comité Combiné de la Mer du Nord et de la Manche Orientale.

Le Sous-comité a estimé nécessaire de réaliser une certaine économie dans la production des tirés-à-part du Bulletin Hydrographique. Vu que la distribution de ces

nally instituted to satisfy a demand of biologists it is now considered desirable to sound their opinion in the matter.

It is suggested that these should in future (if issued at all) deal with the North Sea and English Channel material only. The Hydrographical Committee will await an expression of opinion on this matter from your Committee.

2) To the Chairman of the Hydrographical Committee.

This Committee has considered your letter about the off-prints of the Bulletin Hydrographique. The opinion is that the issue of these off-prints should certainly be continued, as a real demand for them exists.

Appendix II.

Sub-Committee on drift bottle pamphlet.

The Sub-Committee consider that the provision of a pamphlet on the different types of drift bottles is unnecessary for publicity purposes. The types of drifters employed and the methods of preparation are fully described in the various papers and in the bibliographical lists which are readily available in the Journals.

In the various drift bottle experiments full instructions (in different languages) are given on the cards and leaflets enclosed in the bottles so that finders have no difficulty in knowing what to write on the record cards.

Statistical Committee.

Chairman: Professor D'Arcy W. Thompson.
The Committee met at 4.30 p.m., on June 22nd, 1932.

1) The Bulletin for 1929, published after the Council Meeting of March 1931, was laid on the table.
2) The Bulletin for 1930 was presented in proof, including the new monthly tables and charts of the Herring-fishery, prepared in accordance with the Committee's recommandation of a year ago. The Committee approved of these charts and tables, recommended that the monthly tables should be continued from year to year, but that the monthly charts need only be republished (with such improvements as experience might suggest) after a longer interval.
3) The Committee had under consideration the statistics of the salmon and sea-trout fishery and other estuarine fisheries as shown in the Bulletin. The Chairman pointed out that no information was obtained as to these fisheries from certain countries important in this connection; and it was agreed that the Salmon and Trout Committee should be consulted and other steps taken for the improvement of these statistics.

épreuves a été instituée pour satisfaire à une demande des biologistes, il semble désirable aujourd'hui de demander leur avis sur la question.

Il a été suggéré que ces épreuves, si on les produit encore, ne devraient plus traiter que le matériel de la Mer du Nord et de la Manche. Le Comité Hydrographique attend de votre Comité l'expression d'un avis sur la question.

2) Au Président du Comité Hydrographique.

Notre Comité a pris connaissance de votre lettre au sujet des tirés-à-part du Bulletin Hydrographique. Son avis est que la production de ces tirés-à-part doit certainement être continuée car elles sont réellement demandées.

Appendice II.

Sous-comité de la brochure sur les flotteurs de dérive.

Le Sous-comité estime qu'il n'est pas nécessaire de pourvoir à la publication d'une brochure sur les divers types de flotteurs à dérive dans un but de publicité. Les types de flotteurs employés et les méthodes de préparation sont décrits complètement dans les divers travaux et des listes bibliographiques s'obtiennent facilement dans les périodiques.

Dans toutes les expériences avec flotteurs des instructions complètes, en différentes langues, sont données sur les cartes et les feuilles incluses dans le flotteur, de sorte que ceux qui les trouvent n'ont aucune difficulté à comprendre ce qu'il faut écrire sur les cartes de renvoi.

Comité Statistique.

Président: Prof. D'Arcy Thompson.
Le Comité se réunit le 22 juin 1932 à 4h30 p.m.

1) Le Bulletin pour 1929 publié après la réunion du Conseil en mars 1931, est déposé sur la table.
2) Le Bulletin pour 1930 est présenté en épreuves, y compris les nouvelles tables et cartes mensuelles préparées conformément à la recommandation du Comité, faite il y a une année. Le Comité approuve ces cartes et ces tables et recommande que les tables mensuelles soient continuées d'année en année, mais que les cartes mensuelles ne soient republiées (avec les améliorations que l'expérience pourra suggérer) qu'à de plus longs intervalles.
3) Le Comité tient en considération la statistique de la pêche du saumon et de la truite de mer et d'autres pêches d'estuaires ainsi qu'on le voit dans le Bulletin. Le Président fait remarquer qu'on n'a pas obtenu d'informations de certains pays qui sont importants sous ce rapport. Il est décidé que l'on consultera le Comité du Saumon et de la Truite et que d'autres mesures seront prises pour l'amélioration de cette statistique.

4) Dr. LE DANOIS presented, on behalf of Dr. H. B. BIGELOW, a chart of the east coast of North America divided into fishery-areas (Nos. 15 to 28) comparable to the areas Nos. 1 to 14) on the coasts of Europe, already in use by the International Council. The Committee approved of the new areas, agreed to adopt such of them as are visited by European fishermen (East and West Greenland and the Grand Banks, for example), and asked Dr. LE DANOIS to convey the Committee's appreciation and thanks to Dr. BIGELOW.
5) Professor D'ARCY W. THOMPSON was re-elected Chairman for the ensuing year.

Plankton Committee.

Chairman: Prof. H. H. GRAN.
The Committee met on June 21st 1932 at 2.30 p.m.

I. Proceedings.

1) Prof. MIELCK presented the concluding portion of his report on experiments with different types of nets. The Report is now ready for printing.
2) Short reports on the progress of Plankton work in Germany, France, England, Scotland, Ireland, Norway, Denmark, Holland and Belgium were received.
3) The Chairman gave a summary of his Report on the methods and problems concerning the productivity of the sea and the possibility of collaboration in the investigations of the circulation of nitrogen and phosphorous compounds and the yearly cycle of the plankton production in the North Atlantic. A discussion followed. The Report will appear in the "Journal du Conseil".
4) On Prof. MIELCK's proposal it was agreed that the members of the Committee should send to the Chairman in good time before the next meeting short reports on the work done and projected in their respective countries and the aims of their investigations; such reports to be distributed to the members.
5) Prof. GRAN was re-elected Chairman for the ensuing year.

II. Recommendations.

1) It was recommended that the Report on experiments with plankton nets be published.
2) It was recommended that the influence of light on the development and movements of plankton should be considered as a subject for a Biological Scientific Meeting subsequent to 1933 and that as a preliminary Dr. ATKINS be invited to attend the next meeting of the Council in order to discuss with him the application of methods of light determination to plankton work.

4) Le Dr. LE DANOIS présente, au nom du Dr. BIGELOW, une carte de la côte est de l'Amérique du Nord divisée en aires de pêche (Nos. 15 à 28), comparables à celles de la carte d'Europe déjà employées par le Conseil International (Nos. 1 à 14). Le Comité approuve ces nouvelles aires et adopte celles d'entre elles qui sont visitées par les pêcheurs Européens (Est et Ouest du Groenland et les Grands Bancs, par exemple). Il est demandé au Dr. LE DANOIS d'exprimer au Dr. BIGELOW les compliments et remerciements du Comité.
5) Le Prof. D'ARCY W. THOMPSON est réélu Président pour l'année suivante.

Comité du Plancton.

Président: Prof. H. H. GRAN.
Le Comité se réunit le 21 juin 1932 à 2h30 p.m.

I. Compte rendu.

1) Le Prof. MIELCK présente la conclusion de son rapport sur les recherches faites avec les différents types de filets. Le rapport est prêt pour l'impression.
2) Des rapports succincts sur le progrès du travail planctonique sont reçus de l'Allemagne, de la France, de l'Angleterre, de l'Ecosse, de l'Irlande, de la Norvège, du Danemark, de la Hollande et de la Belgique.
3) Le Président donne un sommaire de son rapport sur les méthodes et sur les problèmes de la productivité de la mer et sur la possibilité d'une collaboration dans les recherches sur la circulation de l'azote et des composés phosphorés ainsi que sur le cycle annuel de la production du plancton dans l'Atlantique Nord. Une discussion s'en suit. Le rapport paraîtra dans le "Journal du Conseil".
4) Sur la proposition du Prof. MIELCK il est convenu que les membres du Comité enverront au Président en temps convenable avant la réunion prochaine de courts rapports sur le travail exécuté et projeté dans leurs pays respectifs ainsi que sur le but de leurs investigations. Ces rapports seront distribués aux membres.
5) Le Prof. GRAN est réélu Président pour l'année suivante.

II. Recommandations.

1) Il est recommandé que le rapport sur les expériences faites avec les filets à plancton soit publié.
2) Il est recommandé que l'influence de la lumière sur le développement et sur les mouvements du plancton soit considérée comme un sujet à traiter dans une réunion Scientifique Biologique après celle de 1933, et que, comme mesure préliminaire, le Dr. ATKINS soit invité à assister à la prochaine réunion du Conseil afin de discuter avec lui l'application des méthodes de la détermination de la lumière à l'étude du plancton.

Salmon and Trout Committee.

Chairman: Prof. M. Siedlecki.

The Committee met at 4.0 p.m. on June 20th and at 9.30 a.m. on June 23rd, 1932.

I. Proceedings.

1) The Chairman opened the meeting and paid a tribute to the memory of the late Dr. A. C. Johansen.
2) The matter of the investigation of the salmon, sea trout and other anadromous fishes in the Baltic was discussed and it was agreed that the Committee would undertake this work if so decided with the Baltic Committee.
3) Reports on, and statistics of the catch of salmon in various contributing countries were received and discussed. The stock of salmon was reported as being generally good.
4) The following communications were made by Mr. W. J. M. Menzies: —
   a) On Furunculosis Investigations in Scotland.
   b) On the Migration of Smolts.
   c) On the check shown on Salmon scales during the rapid growth period of the year.
5) Mention was made of the work done in the participating countries during the past year.
6) Dr. Russell reported that the material for a summary of Laws and Regulations concerning salmon and sea trout fisheries in all participating countries had now been received and it was hoped that the summary would be ready in time for the next meeting.
7) It was agreed that all reports and papers to be submitted to each annual meeting should be sent to the Office for circulation to the members of the Committee at least two months before the date of the meeting.
8) The Chairman submitted his observations on the work and scope of the Committee (see Appendix) and arising therefrom a possible programme of work was discussed.
9) The question of a meeting of experts to consider the methods of investigations employed for salmon and sea trout was discussed and it was agreed that such a meeting was desirable. (See Rec. II, 2.)
10) The following programme of investigations was adopted: —
    a) Continuation of the programme outlined at the last meeting.
    b) Observations on the movements and migrations of smolts.
    c) Observations on the formation of checks in the rapid growth period of scales of salmon and sea trout.
    d) Observations on the extent of, and results obtained from, the artificial hatching of ova of salmon, sea trout and trout.
11) Prof. Siedlecki was re-elected Chairman for the ensuing year.

II. Recommendations.

The Committee recommended that:—

1) Each participating country so far as may be practicable should make a return each year to the Office for use in the Bulletin Statistique of the number, weight and value

Comité du Saumon et de la Truite.

Président: Prof. M. Siedlecki.
Le Comité se réunit le 20 juin 1932 à 4h p.m. et le 23 juin à 9h30 a.m.

I. Compte rendu.

1) Le Président ouvre la séance et salue la mémoire du Dr. A. C. Johansen.
2) Les sujets d'investigation sur le saumon, la truite de mer et d'autres poissons anadromes dans la Baltique sont discutés. On décide que le Comité entreprendra le travail si la chose est admise de commun accord avec le Comité Baltique.
3) Des rapports et des statistiques sur la capture du saumon dans divers pays participants sont reçus et discutés. Il est signalé que le stock du saumon est généralement bon.
4) Les communications suivantes sont faites par M. W. J. M. Menzies:
   a) Sur les investigations concernant la furonculose, en Ecosse.
   b) Sur la migration des "Smolts".
   c) Sur l'arrêt qui se montre sur les écailles du saumon pendant la période de l'année où le développement est le plus rapide.
5) Il est fait mention du travail exécuté dans les pays participants pendant l'année passée.
6) Le Dr. Russell annonce que le matériel nécessaire est obtenu, pour la formation d'un sommaire des lois et règlements concernant les pêcheries du saumon et de la truite de mer dans tous les pays participants et qu'il espère que ce sommaire sera prêt en temps voulu pour la réunion prochaine.
7) Il est convenu que tous les rapports et travaux à présenter à chacune des réunions annuelles doivent être envoyés au Bureau central pour être distribués aux membres, au moins deux mois avant la date de la réunion.
8) Le Président expose ses remarques au sujet du travail et du but du Comité (voir l'appendice) et à la suite de cet exposé un programme de travail est discuté.
9) La question d'une réunion d'experts pour examiner les méthodes de recherches employées pour le saumon et la truite de mer est discuté et l'on conclut que cette réunion est désirable. (Voir la recommandation II, 2).
10) Le programme de recherches suivant est adopté:
   a) Continuation du programme esquissé à la précédente réunion.
   b) Observations sur le déplacement et les migrations des "Smolts".
   c) Observations sur la formation de points d'arrêt dans la période de croissance rapide des écailles du saumon et de la truite de mer.
   d) Observations sur l'extension de l'éclosion artificielle des oeufs du saumon, de la truite de mer et de la truite ordinaire et sur les résultats qui en ont été obtenus.
11) Le Prof. Siedlecki est réélu Président pour l'année suivante.

II. Recommandations.

Le Comité recommande:

1) que chacun des pays participants adresse chaque année, autant que possible, au Bureau central pour le Bulletin Statistique un tableau indiquant le nombre, le

of the salmon, sea trout and other anadromous fishes individually, caught in sea and rivers respectively.

2) A meeting of experts to consider the methods of investigations employed for salmon and trout will be desirable in the future.

Appendix.

Remarks on the programme of work of the Salmon and Trout Committee.

By

M. Siedlecki.

The Salmon and Trout Committee has a significance and position somewhat different from those of the other scientific Committees of the International Council for the Exploration of the Sea. This particular position is due to the character of the object forming the chief interest of the work of said Committee i.e. the Study of Salmonid Fishes.

In comparison with other commercial fishes, as for instance herring, cod or plaice, the salmon and the sea trout are, from the economic point of view, decidedly less important.

If we consider the value of the Sea fisheries in 1929, as it is given in the "Bulletin Statistique", we find the total value for the salmon and sea trout to be about 6 million shillings[1]); in the same year we find for the herring 191 millions, for the Cod about 205 and for the plaice about 65 million shillings. The salmonid fishes are never caught in great quantities. In Europe they form an object important chiefly as a food for the richer classes and also as an object of sport. In many countries they constitute an important part of the fresh-water fisheries. Other objects of interest to the Salmon and Trout Committee are the lavaret (*Coregonus lavaretus*) and the sturgeon. Both species are never very numerous and cannot be said to play an important part in the commercial fisheries of Western Europe. But like the salmon they are sold at a very high market price and are consequently often of considerable local importance.

From a scientific point of view the main objects of interest to the Committee, the salmon and the trout, present so many interesting and up till now unsolved problems regarding their habits, life history and their relations to conditions of environment, that the study of these animals stands as one of the most important but at the same time one of the most difficult biological problems of the present day.

The salmon and the sea trout are very widely distributed species living under very different conditions. From the north of Scotland to the north of Spain we find the

[1]) The figures concerning the salmon and sea trout fishery in the Bulletin Statistique for 1929 cannot be regarded as representing the real value of the salmonids caught in the different countries. The important salmon fisheries of Scotland and of some other countries are not included in the Bulletin. It may be estimated that the total value of the salmon caught in 1929 in all European countries amounts to 20 or even 25 million shillings.

poids et la valeur du saumon, de la truite de mer et d'autres poissons anadromes séparément, capturés en mer ou dans les rivières.

2) qu'une réunion d'experts pour examiner les méthodes de recherches employées pour le saumon et la truite soit tenue, dans l'avenir.

Appendice.

Remarques concernant le programme de travail du Comité du Saumon et de la Truite.

Par

M. Siedlecki.

Le Comité du Saumon et de la Truite a une signification et une position un peu différentes de celle des autres Comités scientifiques du Conseil International pour l'Exploration de la Mer. Cette position particulière du dit Comité lui vient du caractère de l'objet qui constitue le principal intérêt de son travail, c'est-à-dire de l'Etude des Poissons Salmonides.

Comparés à d'autres poissons commerciaux tels que, par exemple, le hareng, le cabillaud ou la plie, le saumon et la truite de mer ont, au point de vue économique, une importance décidément moindre.

Si l'on considère la valeur des Pêcheries maritimes en 1929, telle qu'elle est donnée dans le "Bulletin Statistique", on constate que la valeur totale pour le saumon et la truite de mer est d'environ 6 millions de shillings[1]). Dans la même année nous trouvons pour le hareng 191 millions, pour le cabillaud environ 205 et pour la plie 65 millions de shillings. Les poissons salmonides ne sont jamais capturés en grande quantité. En Europe ils n'ont d'importance que pour les classes riches comme article d'alimentation et aussi comme matière de sport. Dans beaucoup de pays ils forment une partie importante des pêcheries d'eau douce. Le lavaret (*Coregonus lavaretus*) et l'esturgeon intéressent aussi le Comité du Saumon et de la Truite. Ces deux espèces ne sont jamais très abondantes et on ne peut pas dire qu'elles jouent un rôle important dans les pêcheries commerciales de l'Europe occidentale. Mais, comme le saumon, elles obtiennent des prix de marché très élevés et, par suite, elles ont souvent une importance locale considérable.

Au point de vue scientifique, les deux principaux objets de l'intérêt du Comité, le saumon et la truite, présentent tant de problèmes intéressants et jusqu'à présent non résolus, dans leurs habitudes, leur biologie et leurs relations avec les conditions de milieu, que l'étude de ces animaux se pose comme l'un des problèmes biologiques les plus importants et, en même temps, les plus difficiles des temps actuels.

Le saumon et la truite de mer ont une distribution très étendue et vivent dans des conditions très différentes. Depuis le nord de l'Ecosse jusqu'au nord de l'Espagne,

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[1]) Les chiffres du Bulletin Statistique de 1929 concernant le saumon et la truite de mer, ne peuvent pas être considérés comme représentant la valeur réelle des salmonides capturés dans divers pays. Les importantes pêcheries de saumon d'Ecosse et de quelques autres pays ne sont pas incluses dans le Bulletin. On peut admettre que la valeur totale du saumon capturé en 1929 dans tous les pays d'Europe s'élève à 20 ou même 25 millions de shillings.

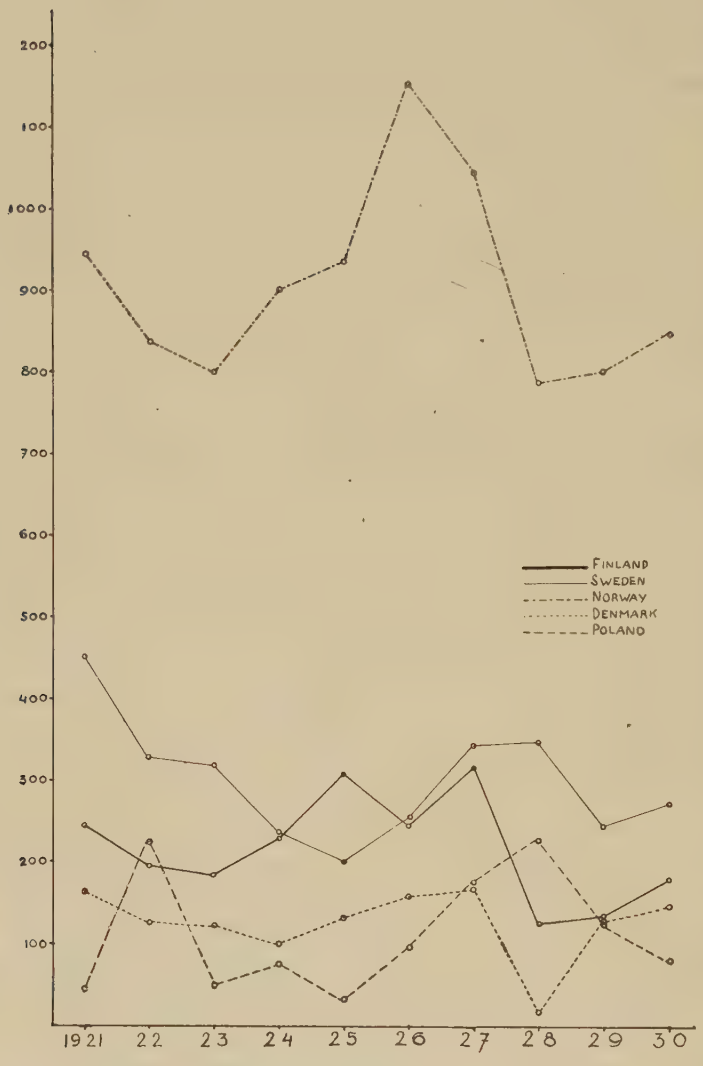


Diagram 1.

salmon living in the highly saline Atlantic waters; but at the same time we find the same species in the Baltic living in waters of very different nature but always of a very low degree of salinity. The same species enters the short and small rivers in Scotland or in Denmark but also ascends big rivers like the Rhine and the Vistula.

It is a very interesting fact that in spite of such wide distribution and widely different conditions of life, the main characteristics of the life history of these fishes always remain similar.

Perhaps the most striking fact is, that notwithstanding the difference of extrinsic conditions in different countries and the wide distribution excluding the possibility of sexual mixing of different stocks of salmon, the fluctuations of the quantity of salmon caught in different countries are of a similar character.

By way of illustration we will consider the statistics of the catch of salmon in five countries representing very different conditions namely: Finland, Sweden, Norway, Denmark and Poland (in tons) (see table on opposite page).

From the statistical table and also the Diagram 1 it appears that in all five countries the product of the Salmon fishery was passably good in 1927.

The year 1924 was very unfavourable in all five countries without exception and the same holds good for 1925. 1927 and 1928 were better salmon years; for Sweden, Norway, Finland, Denmark and Poland 1927 especially was characterised by passably good catches, whereas 1928 was good for Sweden and Poland only, but very bad for Denmark, Finland and Norway. There is also in 1927 and 1928 a general coincidence of fluctuations of catches in the above named countries. The resemblance in character

nous trouvons le saumon vivant dans des eaux atlantiques de haute salinité; mais, en même temps, nous trouvons cette même espèce vivant dans la Mer Baltique dans des eaux de nature très variée mais toujours de très basse salinité. Cette même espèce entre dans de petites et faibles rivières en Ecosse et en Danemark, mais remonte aussi de grands fleuves comme le Rhin et la Vistule.

C'est un fait très intéressant que les principaux caractères de la biologie de ces poissons restent toujours semblables en dépit d'une vaste distribution et de conditions de vie aussi profondément différentes.

Le fait le plus frappant est peut-être que nonobstant la différence des conditions extrinsèques en des régions diverses et l'étendue de l'aire de distribution qui exclut la possibilité d'échanges sexuels entre divers stocks de saumon, les fluctuations de la quantité de saumon capturé dans divers pays, conservent un caractère semblables.

Comme démonstration, considérons la statistique des captures de saumon dans cinq pays représentant des conditions très différentes: la Finlande, la Suède, la Norvège, le Danemark et la Pologne (en tonnes).

	1921	1922	1923	1924	1925	1926	1927	1928	1929
Finlande.....	245	195	184	228	308	244	316	124	135
Suède	451	323	319	235	200	253	342	345	243
Norvège.....	944	837	800	900	935	1,152	1,041	786	799
Danemark	162	127	121	100	132	159	166	18	167
Pologne	43	226	48	72	33	97	176	224	128

Le tableau statistique ainsi que le diagramme 1 nous montrent que dans tous les cinq pays, le produit de la pêche au saumon était assez bon en 1927.

L'année 1924 a été très défavorable dans les cinq pays, sans exception et la même chose se vérifie pour 1925. 1927 et 1928 ont été de meilleures années de saumon; pour la Suède, la Norvège, la Finlande, le Danemark et la Pologne, l'année 1927 a été spécialement caractérisée par des captures passablement bonnes, tandis que 1928 n'a été bonne que pour la Suède et la Pologne, mais a été très mauvaise pour le Danemark, la Finlande et la Norvège. En 1928 il y a aussi une coïncidence générale de fluctuations des captures dans les pays susnommés, mais elle est moins marquée et moins caractéristique qu'en 1927. La ressemblance du caractère des fluctuations du produit de la pêche au saumon, dans différents pays, ressort mieux si l'on considère la stastistique simplifiée illustrée par le diagramme 2. Ce diagramme a été construit en tenant compte des quantités moyennes du produit de la pêche au saumon calculées d'après les résultats de la pêche pendant dix ans, de 1921 à 1930. La quantité moyenne pour une année est: pour la Finlande — 215, la Suède — 298, la Norvège — 903, le Danemark 129, la Pologne — 112 tonnes.

Dans le diagramme nous avons représenté la quantité moyenne par une ligne horizontale. Les années pendant lesquelles la pêche au saumon a donné des résultats surpassant la moyenne, ont été marquées par un point au-dessus de la ligne, les

of the fluctuations in the product of the Salmon fishery in different countries is better recognisable if we consider the simplified statistical figures, (see Diagram 2). We have calculated the mean quantity of Salmon caught in a year in different countries as an average of the catches in 10 years from 1921 to 1030. These average numbers are as follows:

Finland — 215, Sweden — 298, Norway — 903, Denmark — 129, Poland — 112. The mean quantity is represented in the diagram by a horizontal line. The years with the results of the Salmon fishery surpassing the average are marked as a point over the line and the years with the results under the average as a point below the line.

Such a simplified statistic shows clearly that the succession of good and bad Salmon years is extremely similar in Norway and Finland and not very different also in

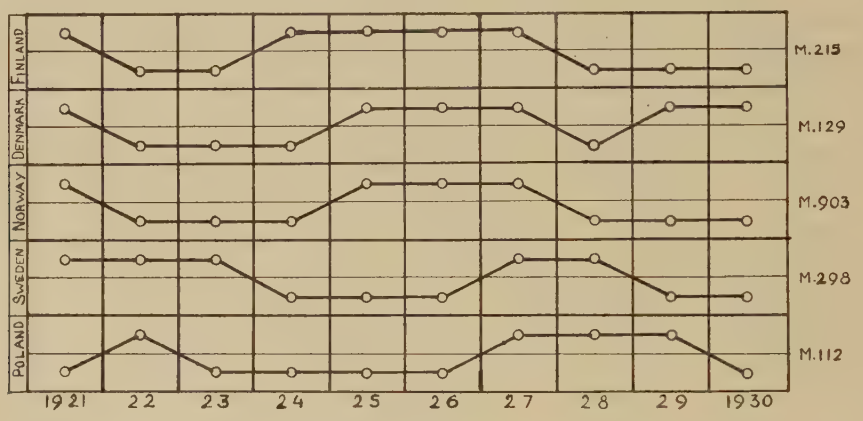


Diagram 2.

Denmark. But from the same diagram it appears that Sweden and Finland differ greatly in the character of the fluctuations of the Salmon fishery in spite of similar geographical position of both countries. What can be the cause of such coincidence between such different and widely separated countries? Why do Norway and Finland show such a striking resemblance in the character of fluctuations in spite of entirely different living conditions of the fishes?

In our opinion there are two possible explanations. The cause of the fluctuations may be dependent on different extrinsic conditions, or may be a result of the inborn racial character of the fish population.

If the extrinsic conditions of life are to be considered as the cause of fluctuations, this would presuppose that the long stretches of land and sea from Norway to Finland present conditions of the same or similar character. The Norwegian Sea and the Baltic present so many differences, and the climatic and hydrographical differences moreover are so strongly marked, that such a supposition would appear highly improbable.

If we consider the fluctuations in the quantity of fishes caught in different countries as a result of a succession of more or less fertile generations, we must also accept as a fact that in every country these generations succeed one another in a definite order,

années avec des résultats au-dessous de la moyenne, ont été marquées par un point au-dessous de la ligne, représentant la moyenne.

Cette statistique simplifiée, qui nous montre la succession des bonnes et des mauvaises années, nous montre aussi d'une façon très claire que la fluctuation de la pêche au saumon était à peu près la même en Norvège et en Finlande et pas beaucoup différente de ce qui s'est passé au Danemark. Mais le même diagramme nous montre aussi que le caractère de la fluctuation de la pêche au saumon, en Suède, est très différent de celui de la Finlande, quoique ces deux pays aient une position géographique très ressemblante. Quelle peut être la cause de pareille coïncidence entre des pays si divers et si distants! Pourquoi la Norvège et la Finlande montrent-elles une aussi frappante ressemblance dans le caractère des fluctuations en dépit des conditions de vie entièrement différentes des poissons?

Dans notre opinion il y a deux explications possibles. La cause des fluctuations peut dépendre de conditions extrinsèques différentes ou résulter d'un caractère de race inné de la population de poissons.

Si les conditions extrinsèques de la vie devaient être considérées comme la cause des fluctuations, cela supposerait que les longues étendues de terre et de mer de la Norvège jusqu'à la Finlande présentent des conditions d'un caractère identique ou similaire. Mais la Mer de Norvège et la Baltique présentent tant de différences et les divergences de climat sont, en outre, si marquées qu'une pareille supposition semble hautement improbable.

Si on considère les fluctuations de la quantité de poissons capturés dans différents pays comme résultant d'une succession de générations plus ou moins fécondes, il faut aussi admettre comme un fait que ces générations succèdent, dans toutes les régions, suivant un ordre défini, caractéristique pour la population de poissons de chacune d'entre elles. Pour expliquer la coïncidence des fluctuations dans différents pays il faudrait admettre que cette succession de générations plus ou moins fécondes s'accomplit en même temps dans chaque pays. Dans mon opinion pareille supposition est très improbable spécialement si on tient compte du fait que le saumon de rivières différentes peut présenter des caractères biologiques et de race distincts.

Mais il est également possible que la coïncidence de fluctuations, moins fortement marquées et incomplètes, telles par exemple, que celles de 1928, puisse avoir pour cause des caractères de race, tandis que des fluctuations de genre de celles qu'on a observées en 1927 ont pu résulter de ces mêmes caractères de race et de l'influence combinée et simultanée des conditions extrinsèques. Il est clair que pareille explication ne peut être acceptée que lorsque les caractères de race, la succession des générations plus ou moins fécondes et aussi l'influence des conditions extrinsèques, nous sont révélées dans tous les détails. Pour obtenir tout cela, une coopération entre divers pays et un échange immédiat d'idées et d'opinions seraient de la plus haute valeur, parceque seule une étude systématique portant sur une aire vaste pourrait nous permettre de distinguer les causes générales, communes à toutes les régions, des causes locales provoquant les fluctuations d'une aire restreinte.

La nécessité d'investigations générales, portant sur les causes affectant des aires

characteristic of the fish population of that country. To explain the coincidence of fluctuations in different countries we must accept the theory that the succession of more and less fertile generations runs parallel in all countries. In my opinion such a supposition seems highly improbable, especially if we consider the fact that salmon from different rivers may represent different biological and racial characters.

But it is also possible that the coincidence of fluctuations not very strongly marked and not complete, as for instance in 1928, can be caused by the racial characteristics, whilst such fluctuation as was noted in 1927 may be the result of the same racial characters and of the influence of the extrinsic conditions working together and at the same time. It is obvious that such an explanation can be accepted only when the racial characters, the succession of the more and the less fertile generations and also the influence of extrinsic conditions are revealed to us in every detail. To achieve this a co-operation between the different countries, and an immediate exchange of ideas and opinions will be of the highest value, because only a systematic study over a large area will make it possible for us to distinguish between the general causes acting in all countries, and the local causes, provoking the fluctuations in a restricted area.

The necessity for general investigations of the causes affecting large areas and having as result the fluctuations of the quantity of fishes caught in the different countries constitutes the main lines of the programme. But it must be pointed out that not all particularities can be studied in all countries. For the present time for instance: the life characteristics of the salmon during the period of feeding and growth in sea-water are more easily studied in the Baltic than in the North Sea. Therefore the Baltic countries must pay more attention to these questions, whilst other countries must profit by such experience gained in the Baltic.

The same method must be adopted for the studies of the life history and the protection of the salmon in the rivers. In each separate country observations are collected under very different conditions which, however, can be of the greatest value for the investigators in all countries. As an example may be quoted the scientific investigations carried out by the late Dr. Johansen on the salmon in the river Gudenaa. The extinction of that species caused by the installation of a barrage was an alarm signal to all countries. In certain Polish rivers we have noticed lately a catastrophic diminution of the quantity of salmon and sea trout caused probably by pollution of the river. At the same time the salmon has been observed in larger quantities in other rivers, where this species had for years been considered extinct or present only in very small numbers.

Such observations although made in one single country are of high value to all investigators. The same can be said of the investigations concerning furunculosis, so extremely important to all countries.

The above will serve as a statement of the working programme laid down by the Salmon and Sea Trout Committee.

Fluctuations of annual catches.

In the first place the fluctuations in the annual catches of salmon and sea trout must be studied. The fundamental issue of such inquiries should be stated in carefully worked out statistical figures.

étendues et y occasionnant les fluctuations de la quantité de poissons capturés dans les divers pays, est à la base des grandes lignes du programme. Mais il faut remarquer qu'il n'est pas possible d'étudier toutes les particularités dans tous les pays. En ce moment, par exemple, les caractères biologiques du saumon pendant sa période d'alimentation et de croissance en eau de mer s'étudient plus facilement dans la Baltique que dans la Mer du Nord. Il faut donc que les pays Baltiques attachent plus d'attention à ces questions, tandis que les autres pays doivent tirer profit des expériences faites dans la Mer Baltique.

La même méthode doit être adoptée pour l'étude des conditions de vie et de la protection du saumon dans les rivières. Les observations, quoique recueillies dans des conditions très différentes dans chacun des pays, peuvent avoir une très haute valeur pour les investigateurs de tous les pays. On peut citer comme exemple les recherches de feu le Dr. Johansen sur le saumon dans la rivière Gudenaa. La disparition de l'espèce, causée par l'installation d'un barrage, a été un signal d'alarme pour tous les pays. Nous avons constaté récemment, dans certaines rivières de Pologne, une désastreuse diminution de la quantité de saumon et de truite de mer, causée probablement par la pollution de la rivière. Mais, en même temps, le saumon a été observé en plus grande quantité dans d'autres rivières où l'espèce était considérée depuis des années comme disparue ou présente seulement en très petit nombre.

Pareille expérience, bien que faite dans un seul pays, est d'une grande valeur pour tous les investigateurs. La même chose peut se dire des investigations concernant la furonculose, si importantes pour tous les pays.

Ces donnés constituent un exposé du programme de travail proposé par le Comité du Saumon et de la Truite.

Fluctuations de la capture annuelle.

Il convient d'étudier en premier lieu les fluctuations de la capture annuelle du saumon et de la truite de mer. Le résultat fondamental de ces recherches devrait être exprimé en chiffres statistiques soigneusement étudiés.

La capture annuelle consistant non seulement en grands individus mais encore en petits d'âge divers, il faut aussi prendre en considération sa composition par âges. Une statistique soigneuse du nombre d'individus d'âge différent capturés en diverses localités apparaît donc comme importante. Ces chiffres peuvent être très utiles dans l'étude des races dans différentes rivières. La comparaison de ces données statistiques obtenues de pays divers nous permettrait probablement de résoudre la question de savoir si les groupes de saumon et de truite de mer qui remontent certaines rivières sont constitués d'individus du même âge ou non, et si l'âge auquel le poisson remonte les rivières est un caractère de race.

Etude de la rapidité de croissance de différents stocks.

L'étude de la rapidité de croissance de divers stocks est d'une très haute importance. S'il était prouvé qu'il existe des races à croissance lente et à croissance rapide dans tous les pays, il faudrait certainement conseiller d'étendre les mesures de protection

Since the annual catch consists not only of large but also of small individuals of different age, the age composition of the annual catch must also be taken into consideration. Careful statistics of the number of individuals of different age taken in different localities would also appear important. Such figures can be very useful when studying the races in different rivers. The comparison of such statistical figures obtained from different countries will probably enable us to decide on the question: whether the shoals of salmon and sea trout ascending certain rivers consist of specimens all of the same age or not — and whether the age at which the fish ascend the rivers is a racial characteristic.

The study of the rate of growth of different stocks.

The study of the rate of growth of different stocks is of very high importance. If it should be proved that slowly and quickly growing races exist in all countries it would certainly be advisable to extend measures for protection and experiments concerning artificial hatching only to the broods of the quickly growing races, in order to obtain the best commercial results in the shortest possible time.

Relations between the external conditions of life and the features of different stocks.

During recent years the investigations of various scientists have proved that the life history of the salmon and the sea trout depends greatly on the extrinsic conditions of life. Prof. Roule expresses his opinion that a sufficient quantity of oxygen is an important factor governing the entrance of salmon into certain rivers; Mr. Southern has pointed out that the rate of growth in salmonid fishes depends largely on the quantity of hydrogen-ions (P_H) in the water. Both questions were studied in the rivers; but up to the present time we have no detailed study of the relation between the time of appearance of the shoals of salmon in the sea and the extrinsic conditions of its life, such as, for instance, the salinity, content of oxygen or content of the hydrogen-ions in the sea water. Data concerning the temperature and the currents in respective parts of the sea will also be very valuable. It is obvious that such studies and observations must be made in different countries over a large area to afford an opportunity of comparing the results obtained under different conditions in order to gain a normal average standard of general rules.

The study of the food of the salmon and sea trout.

The question of the food of the salmon and the sea trout during its ascent of the rivers has been studied for years, and the results arrived at are that in general the salmon takes no food during this period. During recent years, however, certain doubts have been raised by several investigators, and some striking cases published, not only of feeding, but also of the voracity of ascending salmon. As to the sea trout it is an acknowledged fact that two periods of migration may occur, one period of intensive feeding, another of reproduction. During the second period the sea trout in certain rivers takes no food.

It is obvious that a new and closer study of this question will be of great importance. The question what these two species live on when in the sea has not as yet been sufficiently studied. Prof. Roule supposes that the Atlantic salmon feeds on crustaceans.

et les essais de fécondation artificielle uniquement aux races à croissance rapide afin d'obtenir les meilleurs résultats commerciaux dans le temps le plus court possible.

Relation entre les conditions extrinsèques et les traits caractéristiques des différents stocks.

Au cours de ces dernières années les investigations de divers naturalistes ont démontré que la biologie du saumon et de la truite de mer dépend grandement des conditions de vie extrinsèques. Le Prof. Roule a émis l'avis que la présence d'une quantité suffisante d'oxygène constitue un facteur important de l'entrée du saumon dans certaines rivières; M. Southern a établi que la rapidité de la croissance des poissons salmonides dépend largement de la proportion d'ions d'hydrogène (p_H) dans l'eau. Les deux questions ont été étudiées dans les rivières; mais jusqu'ici nous n'avons pas d'étude détaillée sur la relation entre l'époque d'apparition des groupes de saumon dans la mer et les conditions extrinsèques de sa vie telles que, par exemple, la salinité, la quantité d'oxygène ou la proportion d'ions d'hydrogène dans l'eau de mer. Des données sur la température et les courants dans des parties déterminées de la mer seraient aussi très utiles. Il est clair que ces études et ces observations doivent être faites dans différents pays et sur une vaste région pour fournir l'occasion de comparer les résultats obtenus dans des conditions diverses et d'établir une moyenne normale des règles générales.

Etude de la nourriture du saumon et de la truite de mer.

La question de la nourriture du saumon et de la truite de mer au cours de leur ascension dans les rivières a été étudiée depuis des années et le résultat de ces recherches est que le saumon ne prend pas de nourriture pendant cette période. Cependant, au cours de ces dernières années des doutes ont été soulevés par plusieurs investigateurs et on a publié certains cas frappants non seulement d'alimentation mais même de voracité du saumon de montée. Quant à la truite de mer, c'est un fait reconnu que deux périodes de migration peuvent avoir lieu, l'une d'alimentation intensive et l'autre de reproduction. Pendant cette seconde période la truite de mer, dans certaines rivières, ne prend pas de nourriture.

Il est évident qu'une nouvelle étude, plus détaillée, de cette question serait d'une grande importance. La question de savoir de quoi vivent les deux espèces pendant leur séjour en mer n'est pas encore suffisamment étudiée. Le Prof. Roule suppose que le saumon de l'Atlantique se nourrit de crustacés. Dans la Baltique pendant certaines périodes, l'intestin du saumon est rempli de restes de lançon (Ammodytes). On n'a pas encore présenté un rapport complet sur cette question. Pareil rapport est vivement à désirer.

Actuellement l'étude de la nourriture et des conditions d'alimentation, ainsi que celles de l'influence de la nourriture sur la croissance du saumon est plus facile dans la Baltique que dans d'autres mers; mais les résultats de ces investigations sont également intéressants pour tous les pays.

Le fait que les jeunes truites mises directement à la mer (la Baltique) y croissent incomparablement plus vite qu'en eau douce, conduit à penser que la croissance des

In the Baltic during special periods the intestine of the salmon is full of the remains of *Ammodytes*. A complete report on this question has not been submitted. Such a report is very much needed.

Just at present the study of the food, of the conditions of feeding, and also of the influence of food upon the rate of growth of the salmon is easier in the Baltic than in other seas, but the results of such investigations are equally important to all countries.

The fact that young trout, if put straight into the sea (the Baltic) grow very fast and incomparably quicker than in fresh water, leads to the assumption that not only the abundance of food, but also the general conditions of life, have a great influence upon the growth of the salmonid fishes. The question of the relation between the food and the general life conditions and the influence of both agents upon the rate of growth should also be studied.

The study of the migrations of the salmon and the sea trout.

The study of the migrations of both species of salmonid fishes has given very interesting results in different countries. These migrations were the reason for the assumption that every river has its own population of salmon returning to their native waters after the sojourn in the sea. But the question of the migrations in the sea, of the sudden appearance of shoals in certain places and their equally sudden disappearance, are not sufficiently studied. And these latter questions are of high importance for the salmon fishery in the sea.

During the last year a new method of studying the migrations of the salmonids has been introduced by Prof. Järvi and Prof. Willer. It consists in the marking of the adult fishes by means of hooks attached loosely to the angling-lines. By means of such a method it is possible to mark the adult fish. Some very interesting results were obtained by both above-named scientists, but it is desirable to extend such experiments to all countries in order to obtain a clearer view of the life of the salmon and the sea trout in the sea.

Artificial propagation of the salmonid fishes.

It is obvious that the question of artificial propagation of the salmon and sea trout must form one of the chief objects of interest of the Salmon and Trout Committee. The age-long question of the transplanting of races from one river into another has during recent years, come very much to the fore, in consequence of intensive utilisation of water-power and of the development of industries on the banks of rivers. Every country, as was already pointed out by Mr. Gunnar Alm, should supply a certain quantity of salmon and sea trout fry for the purpose of repopulating the rivers. The quantity of fry should be proportional to the salmon and sea trout fishery in each country.

As it is supposed that furunculosis can be propagated through hatcheries, the methods of production of healthy new broods must be studied and eventually introduced in all countries by laws or regulations.

Experiments have been made recently with young salmon and trout in placing them straight into the sea. Such experiments, begun by Prof. Henking and carried on by other German as well as Polish investigators, have in the Baltic given very good results. It was proved that a trout, put straight into salt water when some 14 cm. long,

poissons salmonides n'est pas seulement influencée par l'abondance de nourriture, mais qu'elle l'est grandement aussi par les conditions biologiques générales. Il faudrait donc aussi étudier la question de la relation entre la nourriture et les conditions biologiques générales et celle de l'influence particulière de ces deux causes sur la rapidité de la croissance.

Etude des migrations du saumon et de la truite de mer.

L'étude des migrations de ces deux espèces de poissons salmonides a fourni, dans divers pays, des résultats très intéressants. Ce sont ces migrations qui ont conduit à supposer que chaque rivière possède sa population propre de saumons regagnant leurs eaux natales après un séjour en mer. Mais la question des migrations en mer, de la soudaine apparition de groupements en certaines localités et de leur disparition non moins soudaine n'est pas suffisament étudiée. Ces derniers points sont d'une haute importance pour la pêcherie du saumon en mer.

Une nouvelle méthode d'étude des migrations des salmonides a été introduite l'année passée par le Prof. Järvi et le Prof. Willer. Elle consiste dans le marquage de poissons adultes au moyen de hameçons fixés légèrement à des lignes de pêche. Cette méthode permet aussi de marquer le poisson adulte. Les deux auteurs cités ont obtenu ainsi certains résultats fort intéressants; mais il est à désirer que ces mêmes expériences soient étendues à tous les autres pays, afin d'obtenir une notion plus claire de la vie du saumon et de la truite en mer.

Propagation artificielle des poissons salmonides.

Il va de soi que la question de la propagation du saumon et de la truite de mer compte parmi les principaux objets intéressants pour le Comité du Saumon et de la Truite. La vieille question de la transplantation des races d'une rivière à une autre s'est placée au premier rang ces ans derniers, par suite de l'utilisation intense de la force hydraulique et du développement des industries au bord des rivières. Ainsi que M. Gunnar Alm l'a déjà signalé, chaque pays devrait fournir une certaine quantité de frai de saumon et de truite de mer pour la repopulation des rivières. La quantité de frai devrait être proportionelle à l'importance de la pêche du saumon et de la truite de mer dans chaque pays.

Comme on suppose que la furonculose peut se propager par les établissements de pisciculture, la méthode de production de nouvelles générations saines doit être étudiée et, éventuellement, introduite dans tous les pays, par des lois et des réglements.

On a fait récemment des expériences sur des saumons et des truites jeunes, en les versant directement en mer. Ces expériences commencées par le Prof. Henking et poursuivies par d'autres investigateurs Allemands et Polonais ont donné, dans la Baltique, de très bons résultats. Il a été prouvé qu'une truite versée directement en eau salée à la taille de 14 cms. atteignait en peu de mois une longueur de 40 cms., — résultat qui n'est jamais obtenu dans un temps aussi court en eau douce. Des investigations sur la possibilité de l'emploi de cette méthode sur une plus large échelle dans la culture de la truite, seraient très utiles.

attained a length of about 40 cm. in a few months, — a result never reached in such a short time in freshwater. Investigations on the possibility of employing, on a larger scale, this method of trout culture would be very useful.

The protection of the salmon in the sea.

The minimum size for marketable salmon and sea trout is very different in different countries. Even in countries not very distant from each other, as for instance Sweden and Germany, the minimum size for salmon is 50 and 35 cm. respectively. It is advisable to consider the question of a unification of the rules regulating the minimum size in different countries, but only on the basis of very careful study of the races and of the rate of growth of this fish.

The time when the salmonid fishes ascend the rivers is, in certain cases, also the time of intensive fishery in estuaries or in the lower parts of the rivers. Near the mouth of the salmon-rivers extensive fishing is also taking place during this period in certain localities. This abuse can be regulated by local laws, but in some instances there is a difficulty in introducing such laws if the mouth of the river belongs to other countries than does the upper part of it (for instance the Rhine or the Vistula). Studies must be made to find the best and most practical method for the protection of salmonids in such case.

The question of the pollution of the rivers.

This question has already been studied by the Salmon and Trout Committee, and the report of Prof. Redeke concerning it has been published. But all countries mention the poisonous effect of river pollution, and the improvement of the present conditions is a task of vital importance to all countries. Especially important is the question of how to avoid the danger of introducing biological barrages into the rivers, preventing the fishes from ascending the rivers and reaching their spawning grounds.

Co-operation and critical survey of methods.

From all that has been pointed out, it would appear that the study of the greater part of the questions briefly discussed above might give good results if undertaken in large areas or by several countries working on the same lines. The investigations concerning the migrations of the salmonids, the rate of growth and the effect of environment upon the morphology and life history of fishes, can give satisfactory results only if carried out by means of a co-operation between various countries.

Investigators, working in different countries, may use different methods. Close co-operation and the immediate communication of the results of work is the only way of comparing the methods employed in all investigations and thus estimating their value. Such a critical examination of methods is in my opinion the most important point in the working programme of the Salmon and Trout Committee.

It is obvious that similar considerations apply to the study of other anadromous fishes, not the salmon and the sea trout only. The studies should begin with reports on the actual state of the respective fisheries in different countries. The collection of statistics, the studies of growth, of migrations, of local races — if they exist, — the study of the methods used for the protection and propagation of the different species —

Protection du saumon en mer.

La taille minima pour le saumon et la truite de mer de marché est très variable suivant les divers pays. Même dans des pays peu éloignés l'un de l'autre, comme, par exemple, la Suède et l'Allemagne, la taille minima est respectivement 50 et 35 cms. Il est à conseiller de considérer la question de l'unification des règles fixant la taille minima dans les divers pays, mais seulement sur la base d'une étude très attentive des races et de la rapidité de croissance de ce poisson.

L'époque à laquelle les poissons salmonides remontent les rivières est aussi, dans certains cas, celle de la pêche intensive dans les estuaires et dans le cours inférieur des fleuves. Près de l'embouchure des rivières à saumon, en certaines localités, une importante pêcherie se fait pendant cette période. Cet abus peut être réprimé par des lois locales, mais dans certains cas il est difficile d'établir ces lois, lorsque l'embouchure d'un fleuve n'appartient pas au même pays que le cours supérieur (par exemple le Rhin et la Vistule). Dans ces cas il faudra procéder à l'étude de la méthode de protection des salmonides la plus pratique et la meilleure.

Question de la pollution des rivières.

Cette question a déjà été étudiée par le Comité du Saumon et de la Truite et le rapport du Dr. Redeke qui en traite a été publié. Tous les pays signalent l'effet toxique de la pollution des rivières et l'amélioration des conditions actuelles constitue partout une tâche d'importance vitale. Une question d'une importance spéciale est celle: comment éviter la possibilité de l'établissement, dans les rivières, de barrages biologiques empêchant les poissons de remonter les rivières et d'atteindre leurs terrains de ponte.

Coopération et révision critique des méthodes.

De toutes ces remarques il semble ressortir que l'étude de la plupart des question brièvement discutées ci-dessus pourrait donner de bons résultats si elle était faite sur des aires importantes ou par divers pays adoptant les mêmes lignes de travail. Les recherches concernant les migrations des salmonides, la rapidité de leur croissance et l'influence du milieu sur la morphologie et la biologie des poissons ne peuvent donner des résultats satisfaisants que si elles sont conduites en coopération par divers pays.

Les investigateurs travaillant dans des pays différents peuvent employer des méthodes différentes. Une étroite coopération et la communication immédiate des résultats du travail est la seule manière de comparer les méthodes employées dans toutes les investigations et d'apprécier leur valeur. Cet examen critique des méthodes est, à mon avis, le point le plus important du programme de travail du Comité du Saumon et de la Truite.

Il est bien clair qu'il faudrait prendre en considération les mêmes remarques au sujet des autres poissons anadromes et ne pas les restreindre au saumon et à la truite de mer. Les études devraient débuter par des rapports sur l'état actuel des pêcheries respectives des différents pays. La réunion des données statistiques, l'étude de la croissance, des migrations, des races locales — si elles existent — celle des méthodes employées pour la protection et pour la propagation de chacune des espèces, — forment les grandes

form the general outlines of the programme of investigations. The co-operation of different countries and criticism of methods employed are necessary conditions for the ultimate success of such a programme.

Combined Meeting of the Salmon and Trout Committee and the Baltic Committee.

The Committees met on June 21st, 1932, at 2.30 p.m.

I. Proceedings.

2) Prof. SIEDLECKI was elected Chairman.

1) The question of the division of work between the two above-named Committees was submitted to discussion and the recommendation (see below) was unanimously adopted.

II. Recommendation.

It was unanimously agreed that all questions affecting salmon and trout and other anadromous fishes should be referred to and dealt with by the Salmon and Trout Committee. The preparation of resolutions for International Conventions for distinct areas should, however, be in the hands of the appropriate Area Committee.

Whaling Committee.

Chairman: Prof. JOHAN HJORT.

The Committee met at 9.30 a.m. on June 21st, 1932.

I. Proceedings.

1) The preceding year's Publications and international Statistics.

At the request of the Chairman Mr. BORLEY gave a short review of the work accomplished by the Discovery Committee in regard to the main problem of the Committee. He referred to the report on the age of fin-whales by Dr. WHEELER and said that investigations had been carried out on the age-composition of the South-Georgia catch. Reports dealing with the plankton and hydrography of the Antarctic south of the Atlantic would appear shortly. He outlined also the present programme of the R. R. S. "Discovery II" and the work carried out by the R. R. S. "William Scoresby" on the western coast of South America.

The Committee asked Mr. BORLEY to convey to Dr. WHEELER the Committee's congratulations on his work in the Antarctic.

The Chairman referred to the Norwegian publication No. 3 of "Hvalraadets Skrifter" emphasising the importance of the statistics collected by the Norwegian pelagic fleet and their bearing upon the scientific problems. He called attention to the journal which the ships were obliged by law to keep and a sample of which was printed in the report. On these journals, he said, were based the control of the enforcement of the Norwegian law passed in 1929 and all material given in the paper. Charts had been worked out giving the catch of the blue- and fin-whales according to month and geographical position, thus showing the distribution of the stock and the expansion of the operations. A great change could thus be traced in the percentage of

lignes du programme de ces investigations. La coopération des différents pays et l'examen critique des méthodes employées sont les conditions nécessaires au succès final de ce programme.

Réunion combinée du Comité du Saumon et de la Truite et du Comité Baltique.

Les Comités se réunissent le 21 juin 1932 à 2h30 p.m.

I. Compte rendu.

1) Le Prof. Siedlecki est élu Président.
2) La question de la division du travail entre les deux Comités susnommés est soumise à la discussion et la recommandation ci-dessous est adoptée à l'unanimité.

II. Recommandation.

Il est reconnu, par accord unanime, que toutes les questions relatives au saumon, à la truite et aux autres poissons anadromes devraient être portées devant le Comité du Saumon et de la Truite et traitées par lui. La préparation de résolutions en vue de conventions internationales concernant des aires distinctes, devrait, toutefois, être réservée aux Comités des secteurs correspondants.

Comité de la Baleine.

Président: Prof. Johan Hjort.

Le Comité se réunit le 21 juin à 9h30 a.m.

I. Compte rendu.

1) Publications de l'année précédente et Statistique internationale.

A la demande du Président, M. Borley présente une courte révision du travail accompli par le Comité du "Discovery" au sujet du problème principal du Comité de la Baleine. Il rappelle le rapport du Dr. Wheeler sur l'âge des *Balaenoptera Musculus* et signale que des investigations ont été faites au sujet de l'âge dans la capture générale de la Géorgie du Sud. Des rapports sur le plancton et sur l'hydrographie de l'Antarctique au sud de l'Atlantique paraîtront prochainement. M. Borley esquisse aussi le programme actuel du R. R. S. "Discovery II" et le travail déjà exécuté par le R. R. S. "William Scoresby" sur la côte ouest de l'Amérique du Sud.

Le Comité prie M. Borley de présenter au Dr. Wheeler ses félicitations au sujet de son travail dans l'Antarctique.

Le Président signale la publication norvégienne No. 3 du "Hvalraadets Skrifter" et insiste sur l'importance de la statistique réunie par la flotte pélagique norvégienne et sur sa signification pour l'étude des problèmes scientifiques. Il attire l'attention sur le journal que la loi oblige les navires de tenir et dont une copie est donnée dans le rapport. C'est sur ce journal, dit-il, qu'est basé le contrôle de l'observation de la loi norvégienne de 1929 ainsi que tout le matériel exposé dans la publication. Des cartes ont été dressées; elles indiquent la capture des *Balaenoptera Sibbaldii* et *Musculus* pour chaque mois ainsi que la position géographique, et montrent aussi la distribution du stock et l'extension des opérations. On a pu ainsi découvrir une grande

the young from one area to another, but it could not yet be determined whether this was due to fishing or migration. On the other hand no difference appeared in the mean-lengths of the stock of areas which had been fished for twenty-five years or a short time only.

The Chairman then referred to the last issue, No. 2, of the International Whaling Statistics, and said that No. 3 was in the press.

Mr. Borley expressed appreciation of the great utility of the publication, but hoped that it would be possible to define more clearly the regions of capture. He gave instances in which it was necessary to know this, and since the information would be afforded if not only the Norwegian, but all pelagic whaling results were published in the rectangles adopted in "Hvalraadets Skrifter" No. 3, an attempt was being made in England to obtain the necessary particulars from English whalers. He hoped this system might be employed for all Antarctic pelagic whaling and that as far as possible mature and immature whales might be distinguished by size as in the report mentioned. Recommendation II, 1 was adopted.

2) The present situation of the Whaling Industry.

The Chairman informed the Committee that Norway had ratified the convention of Geneva and emphasised the need of prompt action on the part of the signatory Governments if the convention was to have effect during the coming season. He also strongly recommended the use of the ships' journal referred to above as a basis for governmental control. Recommendation II, 2 was adopted.

3) Problems of the protection of the stock of whales.

The Chairman referred to the "Production Agreement" adopted by the Association of Whaling Companies, copies of which had been distributed to the Members, and said that the whalers had voluntarily imposed upon themselves a limitation which a law could never have enforced.

After some discussion in which it was agreed that the Committee could consider the agreement in respect of its effect on the stock of whales Recommendation II, 3 was adopted.

4) Prof. Johan Hjort was re-elected Chairman for the ensuing year.

II. Recommendations.

1) The Committee expressed their appreciation of the assistance afforded by the International Whaling Statistics, and their thanks to Dr. Hjort and those concerned in their production. They trust that the series may be continued, and that it may be possible to define more clearly the regions of capture. In particular they were anxious that the particulars for pelagic Antarctic whaling might be presented in tables according to the areas adopted in "Hvalraadets Skrifter" No. 3, distinguishing as far as possible the mature and immature, in the manner employed in that report.

2) The Committee regarded a whaling journal such as the Norwegian whalers are required by their Government to keep as a valuable and simple method of collecting

variation dans le pourcentage des jeunes d'une aire à une autre, mais sans pouvoir déterminer si elle était due à la pêcheries ou à une migration. D'autre part, on n'a pu noter aucune différence entre la longueur moyenne du stock des aires qui ont été exploitées depuis vingt-cinq ans et celle des aires qui ne le sont que depuis peu de temps.

Le Président parle de la dernière publications, No. 2, de la Statistique Internationale de la Baleine et dit que le No. 3 est sous presse.

M. Borley fait ressortir la grande utilité de la publication, mais espère qu'il deviendra possible de définir plus clairement les régions de capture. Il cite des exemples dans lesquels cette connaissance eût été nécessaire et, comme cette information serait fournie si tous les résultats de la pêcherie baleinière pélagique — et non seulement les résultats norvégiens — étaient publiés dans les rectangles adoptés dans le No. 3 du "Hvalraadets Skrifter", une tentative est faite en Angleterre pour obtenir les détails nécessaires des baleiniers Anglais. Il espère que ce système pourra être employé pour toute la pêcherie baleinière antarctique et qu'on pourra, autant que possible, distinguer les baleines matures et immatures d'après leur taille ainsi qu'il est fait dans le rapport mentionné. La recommandation II, 1 est adoptée.

2) La situation actuelle de l'Industrie Baleinière.

Le Président communique au Comité que la Norvège a ratifié la convention de Genève et insiste sur la nécessité d'une action prompte de la part des Gouvernements signataires, si la convention doit produire un effet pendant la saison prochaine. Il recommande vivement aussi l'usage des journaux de bord signalés plus haut, comme base d'un contrôle gouvernemental. La recommandation II, 2 est adoptée.

3) Problèmes de la protection du stock de baleines.

Le Président parle de "l'accord de production" adopté par l'Association des Compagnies baleinières. Des exemplaires en ont été distribués aux membres. Le Président dit que les baleiniers se sont imposés volontairement une limitation qu'une loi n'eût jamais pu mettre en vigueur.

Après une discussion au cours de laquelle le Comité se rallie à cet accord en considération de l'effet qu'il doit exercer sur le stock de baleines, la recommandation II, 3 est adopté.

4) Le Prof. Johan Hjort est réélu Président pour l'année suivante.

II. Recommandations.

1) Le Comité déclare apprécier l'assistance fournie par la Statistique Internationale de la Baleine, et exprime ses remerciements au Dr. Hjort et aux personnes qui ont contribué à la dresser. Il espère que les séries pourront être continuées et qu'il deviendra possible de définir plus clairement les régions de capture. Il est particulièrement désireux de voir les détails de la pêcherie baleinière pélagique présentés sous la forme de tables conformes à celles des aires adoptées par le "Hvalraadets Skrifter", No. 3, qui distingue autant que possible les baleines matures et immatures suivant la manière employée dans le rapport.

2) Le Comité estime qu'un journal baleinier tel que celui qui est imposé aux baleiniers Norvégiens par leur Gouvernement, constitue une méthode simple et effective de

the information necessary for statistical purposes and for the enforcement of the Convention for the Regulation of Whaling.

3) The Committee regarded the agreement between the great majority of the whaling companies to restrict their catch during 1932—33 to an agreed proportion of their catch in 1930—31 as a valuable measure, and wished to record their opinion that it is in the interests of the whaling industry that such agreement should receive the adhesion of all whaling companies.

Editorial Committee.

Chairman: Prof. O. Pettersson.
The Committee met on June 23rd 1932 at 2.30 p.m.

I. Proceedings.

1) The Chairman laid before the Committee the report regarding the publications issued in the financial year 1931—32 and the cost of these.

2) The Chairman laid before the members a proof-print of Dr. Buch's Report on the investigations on carbonic acid made in Helsingfors last year according to the Council's Resolution (see Proc.-Verb. Vol. LXVI, p. 64 par. 5), and informed them that the Bureau had decided by correspondence to print this Report.

3) One of the papers announced for publication was discussed, namely: an atlas containing the salinity and temperature normals for the North Sea, the printing of which had been recommended by the Hydrographical Committee. Prof. Knudsen laid a sample of the charts before the Committee and said that it was the intention to print the atlas in $^3/_4$ size of the charts and to shade the lands. Prof. D'Arcy Thompson suggested the reduction of the area covered by the charts in order to arrive at a more handy size and the omission of the names of the countries. Prof. Hjort suggested the reduction of the size to that of the Bulletin Hydrographique, i. e. to about half size. After some discussion Prof. Knudsen agreed to put this proposal before the Sub-Committee for Salinity Normals and inform the Bureau of their decision. A discussion also arose concerning the possibility of printing the charts by means of blocks instead of lithographic reproduction as suggested by the Hydrographical Committee.

Recommendation II, 1 was adopted.

4) The new Administrative Secretary laid before the Committee a proposal regarding the technical aspect of the printing designed to save money. He proposed to augment the printed space of the page from $7^3/_8'' \times 5^3/_4''$ to $8^1/_4'' \times 6^1/_4''$ and to print in two columns. For comparison he pointed out that Vol. LXXIV of 204 pages according to his suggestion would fill 136 to 144 pages only, and he had reason to believe that the price could be reduced from some Kr. 4250 to less than Kr. 3000.

Prof. D'Arcy Thompson agreed to the proposal, and reminded the members of the Committee that, when some years ago certain changes had been adopted in the

réunir l'information nécessaire pour la statistique et pour la tenue en vigueur de la Convention pour la Réglementation de la Pêcherie Baleinière.

3) Le Comité considère comme une mesure efficace l'accord adopté par la grande majorité des compagnies baleinières, de restreindre leur capture en 1932—33 à une proportion convenue de leur capture de 1930—31 et désire établir que son avis est que c'est dans l'intérêt de l'industrie baleinière que cet accord devrait recevoir l'adhésion de toutes les compagnies baleinières.

Comité Editorial.

Président: Prof. O. Pettersson.
Le Comité se réunit le 23 juin 1932 à 2h30 p.m.

I. Compte rendu.

1) Le Président présente au Comité le rapport concernant les publications parues pendant l'année financière 1931—32 et leur coût.

2) Le Président présente aux membres une épreuve du rapport du Dr. Buch sur les investigations sur l'acide carbonique faites à Helsingfors l'année passée, conformément à la résolution du Conseil (Voir Rapp. & Proc.-Verb. Vol. LXVI p. 65 par. 5), et leur fait savoir que le Bureau a décidé par correspondance l'impression de ce rapport.

3) La publication d'un des travaux annoncés est discutée, à savoir: un atlas contenant les normales de salinité et de température pour la Mer du Nord, dont l'impression a été recommandée par le Comité Hydrographique. Le Prof. Knudsen dépose un exemplaire des cartes devant le Comité et dit qu'on a l'intention d'imprimer l'atlas aux $^3/_4$ de la dimension de ces cartes et de teinter les pays. Le Prof. D'Arcy Thompson suggère de couper les cartes à la limite des parties en blanc, afin de les réduire à un format plus maniable, et d'omettre les noms des pays. Le Prof. Hjort propose de réduire ce format à celui du Bulletin Hydrographique, c'est-à-dire à peu près à la moitié. Après discussion le Prof. Knudsen se rallie à l'idée de soumettre cette proposition au Sous-Comité des normales de salinité et d'informer le Bureau de sa décision. Une discussion est également soulevée au sujet de la possibilité d'imprimer les cartes au moyen de clichés, au lieu de la reproduction lithographique, ainsi que l'a suggéré le Comité Hydrographique.

La Recommandation II, 1 est adoptée.

4) Le nouveau Secrétaire Administratif dépose devant le Comité une proposition concernant le côté technique de l'impression en vue de réaliser une économie. Il suggère l'idée d'augmenter la surface imprimée sur la page, de $7^3/_8'' \times 5^3/_4''$ à $8^1/_4'' \times 6^1/_4''$ et de composer en deux colonnes. Il fait remarquer comme comparaison, que le volume LXXIV qui à 204 pages, n'occuperait, suivant sa suggestion, que de 136 à 144 pages, et il a des raisons de penser que très probablement le prix pourrait être réduit de 4250 Kr. à 3000 Kr.

Le Prof. D'Arcy Thompson se rallie à cette proposition et rappelle aux membres du Comité que lorsque, il y a quelques années, certains changements furent apportés

form of printing the Rapports & Procès-Verbaux, no changes had been made with regard to the Bulletin Hydrographique; to which Prof. KNUDSEN replied that it had been recommended by the Hydrographical Committee at its present meeting that the Bulletin should be printed in a more compressed form and with smaller type.

Recommendation II, 2 was adopted.

With regard to the Journal Dr. RUSSELL suggested that a saving might be arrived at by: — 1) putting a limit to the honoraria paid to contributors for general articles and reviews, 2) using smaller type or 3) limiting the number of contributions. Prof. SIEDLECKI pointed out that several publishers now request the authors to limit their contributions to a fixed number of pages, but Dr. RUSSELL would rather propose to limit the number of pages for which honoraria were paid. It was left to the Editor of the Journal and the Administrative Secretary to take decisions with regard to a possible reduction of the cost of the Journal.

5) The Chairman referred to the Estimate of publications amounting to Kr. 47,300 which had been distributed; taking into consideration the reductions made possible by the various changes recommended, it was anticipated that this sum might be brought down to the 45,000 Kr. which had been stipulated by the Bureau as a maximum.
6) Dr. RUSSELL informed the members that he was sometimes in doubt whether he ought to publish in the Journal papers handed in by Russian contributors, and it was agreed that such papers should not be accepted except in special cases.
7) The Committee thanked the Chairman for his services during the past year and proposed his re-election with acclamation.

II. Recommendations.

1) It was recommended to publish the following papers: —

North Western Area Report.

Report on Experiments with Plankton nets.

Report on Investigations of Submarine waves.

It was further recommended to publish, in the size of the Bulletin Hydrographique, an atlas of the salinity and temperature normals in the North Sea.

2) It was unanimously recommended to increase the printed space of the Rapports & Procès-Verbaux and to print these publications in two columns.

à la forme de l'impression des Rapports et Procès-Verbaux, aucun changement n'a été apporté au Bulletin Hydrographique. A cela le Prof. KNUDSEN répond qu'il avait été recommandé par le Comité Hydrographique, à la présente réunion, que le Bulletin soit imprimé sous une forme plus serrée et avec de plus petits caractères.

La recommandation II, 2 est adoptée.

Au sujet du Journal, le Dr. RUSSELL suggère qu'une économie pourrait être réalisée: 1) en limitant les honoraires payés à ceux qui fournissent des articles généraux et des revues; 2) en employant de plus petits caractères; ou, 3) en limitant le nombre des contributions. Le Prof. SIEDLECKI fait remarquer que divers éditeurs prient maintenant les auteurs de limiter leurs contributions à un nombre déterminé de pages mais le Dr. RUSSELL proposerait plutôt de limiter le nombre de pages pour lequel un honoraire serait payé. Il est laissé à l'Editeur du Journal et au Secrétaire Administratif de prendre des décisions au sujet d'une réduction possible du prix du Journal.

5) Le Président revient sur l'estimation des dépenses de publication s'élevant à 47.300 cr. qui a été distribuée. En tenant compte des réductions rendues possibles par les divers changements recommandés, on peut s'attendre à voir cette somme réduite à 45.000 cr. — somme qui a été stipulée par le Bureau, comme un maximum.

6) Le Dr. RUSSELL communique aux membres qu'il a dû parfois se demander s'il fallait publier dans le Journal certains travaux envoyés par des auteurs Russes. Il est décidé que ces travaux ne doivent pas être acceptés, sauf dans certains cas spéciaux.

7) Le Comité remercie le Président pour ses services pendant l'année passée et propose sa réélection par acclamation.

II. Recommandations.

1) Il est recommandé de publier les travaux suivants:

Rapport du Secteur Nord Ouest.

Rapport sur les Expériences avec des Filets à Plancton.

Rapport sur les Investigations sur les Vagues Sous-marines.

En outre il est recommandé de publier sous le format du Bulletin Hydrographique un atlas des normales de salinité et de température dans la Mer du Nord.

2) Il est unanimement recommandé d'agrandir la surface imprimée des Rapports et Procès-Verbaux et de les imprimer en deux colonnes.

Reports of Special Scientific Meetings.

Biological Scientific Meeting.

Chairman: Mr. Henry G. Maurice.
The Meeting was held on June 24th, 1932, at 9.30 a.m.

I. Proceedings.

The following lectures were given:

1) Prof. E. Ehrenbaum: Der Fang jugendlicher Heringe in seinem Einfluss auf die Heringsbestände.
   Discussion: Mr. S. K. Asserson.
2) Dr. E. Fischer: Die Wirkung des Fanges untermassiger Fische auf den Bestand.
   Discussion: Dr. K. A. Andersson, Prof. W. Mielck and Dr. Bückmann.
3) Dr. A. Bowman: The Effect on the Stock of the Capture of undersized Fish. The Haddock Population of the North Sea Plateau.
4) Mr. Aage J. C. Jensen: The Effect of the Plaice Fishery on the Stock of undersized Plaice and its Influence on the Yield of the Plaice Fishery in the North Sea.
   Discussion: Prof. Strodtmann, Prof. Mielck and Dr. Bückmann.
5) Dr. H. Blegvad: The Effect on the Stock of the Capture of undersized Plaice in Danish Waters inside the Skaw.
6) Prof. G. Gilson: Destruction of Young Fish on the Continental Coast.
7) Dr. A. Bückmann: Die Frage nach der Zweckmässigkeit des Schutzes untermassiger Fische und die Voraussetzungen für ihre Beantwortung.
   Discussion: Dr. H. Blegvad.
8) Dr. E. S. Russell: Is the Destruction of Undersized Fish by Trawling prejudicial to the Stock?
   Discussion: Prof. D'Arcy W. Thompson.
9) Prof. Johan Hjort: Remarks on the Relationship between the Fluctuations in the Number of Populations and the Growth of the Individuals.

II. Conclusions.

1) The natural history of the Herring, and the herring fisheries of the several countries, have been intensively studied: and an intimate knowledge has been acquired of the biology of this fish, and of the composition of its shoals with regard to age, sex, maturity and origin. Furthermore, the catch of small herrings in Norway, Great Britain, Holland and Germany, and the trawl-fishery for herring, have been taken into careful consideration. According to our present knowledge it may be declared

Rapports des Réunions Spéciales Scientifiques.

Réunion Scientifique Biologique.

Président: M. Henry G. Maurice.
La réunion se tient le 24 Juin 1932 à 9h30 a.m.

I. Compte rendu.

Les communications suivantes sont présentées:

1) Prof. E. Ehrenbaum: L'effet de la capture des harengs jeunes sur le stock des harengs.

Discussion: M. S. K. Asserson.

2) Dr. E. Fischer: L'effet de la capture des poissons de taille inférieure sur le stock.

Discussion: Le Dr. K. A. Andersson, le Prof. W. Mielck et le Dr. A. Bückmann.

3) Dr. A. Bowman: L'effet de la capture des poissons de taille inférieure sur le stock. La population d'églefin du Plateau de la Mer du Nord.

4) M. Aage J. C. Jensen: L'effet de la pêcherie de plies sur le stock de plies de taille inférieure et son influence sur le rendement de la pêcherie de plie dans la Mer du Nord.

Discussion: Le Prof. Strodtmann, le Prof. Mielck et le Dr. Bückmann.

5) Dr. H. Blegvad: L'effet sur le stock de la capture de plie de taille inférieure dans les eaux danoises en dedans du Skagen.

6) Prof. G. Gilson: La destruction des poissons jeunes à la côte continentale.

7) Dr. A. Bückmann: La question de savoir si la protection du poisson de taille inférieure est opportune et les propositions pour la résoudre.

8) Dr. E. S. Russell: La destruction par le chalut de poissons de taille inférieure est-elle préjudiciable au stock?

Discussion: Le Prof. D'Arcy W. Thompson.

9) Prof. Johan Hjort: Remarques sur la relation entre les fluctuations du nombre des populations et la croissance des individus.

II. Conclusions.

1) La biologie du Hareng et les pêcheries du hareng des divers pays ont été soumises à une étude intensive et on a obtenu ainsi une connaissance intime de la biologie de ce poisson et de la composition de ses groupements, en point de vue de l'âge, du sexe, de la maturité et de l'origine. En outre, on a pris en sérieuse considération la capture des jeunes harengs, en Norvège, en Grande Bretagne, en Hollande et en Allemagne de même que la pêche au chalut des harengs. Dans l'état actuel de nos connais-

for the seas of Northern Europe — except the Baltic, for which our information is not sufficient — that:—

The present method, and present extent, of capture of young herrings do not involve appreciable damage to the stock, nor (consequently) to the yield of the fisheries.

2) From the Council's study and investigation of the Haddock, the Meeting draws the conclusion that in the interest of the upkeep of the stock the present extent of capture of the younger year-classes is extremely undesirable: and that a considerable saving of these year-classes could be effected by the use of trawl-nets with larger mesh.

3) It is the considered opinion of the Meeting that investigation of the stock of Plaice in the southern North Sea has shown that an unrestricted fishery, especially on the so-called Nursery Grounds, is a danger to the maintenance of the marketable stock, and is likely to be followed by a diminution of the yield.

The size-limits, close-times and closed areas, formerly recommended by the International Council, were meant to guard against this danger. But a change has lately occurred in the state of affairs, in that steam-trawlers now keep off the nursery grounds, and the fishery is mainly carried out there by motor-cutters using the Danish seine and subject to a size-limit. It appears that the saving of the stock of plaice resulting from this change is sufficient for the present: provided that no new dangers arise, such as might come (for instance) from an increased demand for small undersized plaice for the fishmeal factories, or for other purposes.

Hydrographic Scientific Meeting.

Chairman: Prof. M. Knudsen.
The Meeting was held on June 24th, 1932, at 10 a.m.

Proceedings.

1) At the request of the Chairman the provisional results of the international expedition in the Cattegat during August last year were discussed.

Professor B. Schulz made a communication about the investigations carried out by Germany, Finland, Sweden and Denmark. Germany had worked with two ships and the other countries with one ship each.

Certain investigations concerning temperature, salinity, current and oxygen had been obligatory for all ships but special investigations had also been made. Drift-bottles had been set out from all the ships every hour and the results of the drift had been worked up provisionally.

Discussions took place on the results obtained and on the experience that might be gained from them in connection with kindred subjects.

sances il est permis de déclarer pour les mers de l'Europe septentrionale — sauf la Baltique, pour laquelle notre information est encore insuffisante — que:

les méthodes et l'extension actuelle de la capture des jeunes harengs n'entraîne pas de dommage appréciable pour le stock, ni — par conséquent — pour le produit des pêches.

2) La Réunion, se basant sur les études et les investigations du Conseil sur l'Eglefin arrive à la conclusion que la capture des jeunes classes de l'églefin a pris actuellement une extension extrèmement fâcheuse au point de vue de la conservation du stock et qu'on pourrait épargner considérablement ces jeunes classes par l'emploi de chaluts à mailles plus larges.

3) L'avis mûrement pesé de la Réunion est que les investigations sur le stock de Plie dans le sud de la Mer du Nord ont montré qu'une pêche sans restriction, spécialement sur les fonds appelés "Nurseries", constitue un danger pour la conservation du stock de marché et qu'elle aura probablement pour conséquence une diminution du rendement.

Les tailles minima, la fermeture de certaines époques, la clôture de certaines aires, recommandées précédemment par le Conseil International, avaient pour but de parer à ce danger. Cependant il s'est produit récemment un changement dans l'état des choses, du fait que les chalutiers à vapeur se tiennent maintenant au large des Nurseries et que la pêche sur celles-ci se fait principalement par des côtres à moteur employant la seine danoise et soumis à une taille minima. Il semble que l'épargne du stock de plie résultant de ce changement est suffisante pour le moment, pourvu qu'il ne se produise pas de nouveaux dangers tels, par exemple, que celui qui pourrait provenir d'une augmentation de la demande de la petite plie inférieure à la taille minima pour les usines de farine de poissons ou pour d'autres buts.

Réunion Scientifique Hydrographique.

Président: Prof. M. Knudsen.
La réunion se tient le 24 Juin 1932 à 10h a.m.

Compte rendu.

1) A la demande du Président les résultats provisoires de l'expédition internationale dans le Cattégat en Août de l'année passée sont discutés.

Le Prof. B. Schulz présente une communication sur les investigations exécutées par l'Allemagne, la Finlande, la Suède et le Danemark. L'Allemagne a travaillé avec deux navires et les autres pays chacun avec un navire.

Certaines investigations concernant la température, la salinité, le courant et l'oxygène ont été obligatoires pour tous les navires; mais on a fait aussi des investigations spéciales. Des flotteurs de dérive avaient été libérés de tous les navires à chaque heure et les résultats de la dérive ont été examinés provisoirement.

Des discussions ont lieu au sujet des résultats obtenus et de l'expérience que l'on peut tirer d'eux et de leurs rapports avec des questions connexes.

Dr. THORADE, Prof. DEFANT, Prof. EKMAN, Prof. WITTING, Prof. ZEILON, Prof. PETTERSSON and Dr. JACOBSEN took part in this discussion.

2) Professor KNUDSEN asked for proposals for subjects to be treated at next year's meeting.

Professor EKMAN drew attention to the method of determining the movement of the water by means of the position of the isotherms and the isohalines, which question recently had been treated by Prof. DEFANT and Dr. THORADE.

3) It was agreed that the treatment of this subject would be well suited for a discussion and that it could be taken up in connection with the problems that had been treated this year.

It was then agreed that the problems to be discussed at next year's Scientific Meeting should be the same as have been treated this year.

On the proposal of Professor KNUDSEN it was recommended that arrangements should be made for an oral report on the final provisional results to be given at a plenary meeting of the Council next year.

Le Dr. Thorade, les Profs. Defant, Ekman, Witting, Zeilon, Pettersson, et le Dr. Jacobsen prennent part à cette discussion.

2) Le Prof. Knudsen demande des propositions pour des sujets à traiter à la réunion de l'année prochaine.

Le Prof. Ekman attire l'attention sur la méthode de détermination du mouvement de l'eau au moyen de la position des isothermes et des isohalines — question qui a été traitée récemment par le Prof. Defant et le Dr. Thorade.

3) Il est agréé que traiter ce sujet devrait faire l'objet d'une discussion et qu'on pourrait l'aborder en liaison avec les problèmes qui ont été traités cette année.

Alors il est agréé que les problèmes devant être discutés à la Réunion Scientifique de l'année prochaine seraient les mêmes que ceux qui ont été traités cette année.

Sur la proposition du Prof. Knudsen il est recommandé que l'on prenne des mesures afin qu'un rapport oral sur les derniers résultats provisoires puisse être présenté l'année prochaine en séance plénière du Conseil.

REPORT

of

ADMINISTRATION 1931—1932.

I. General.

Composition of the International Council for the Exploration of the Sea.

Italy, a member since 1927, has withdrawn from the Council. Rear-admiral Ramos da Costa has withdrawn as Delegate for Portugal, and two new Delegates have been appointed for Portugal: Rear-Admiral Tito de Morais, President of the Central Commission for Fisheries of the Admiralty and Dr. Alfredo Ramalho. For Spain Professor José Giral is appointed 2nd Delegate, but may be represented by Professor Rafael de Buen. Professor D. Damas, of the University of Liège, has been appointed 2nd Delegate for Belgium

Composition of the Bureau.

The members of the Bureau were the same as in the preceding year:— Mr. H. G. Maurice, President, Professor Johan Hjort, Professor Otto Pettersson, M. Théodore Tissier and Dr. C. Heinrici, Vice-Presidents.

Committees.

A list of the Committees will be found in the Procès-Verbaux of the last Council Meeting. All these Committees remain in being and continue their activities.

Audit of Accounts.

The Accounts of the Council for 1930—31, audited by a qualified accountant and examined and found correct by the Finance Committee, will be submitted to the Council for final approval.

A statement is given below of the Accounts for 1931—32 which have to be examined by the Finance Committee.

Statement of Accounts for the financial year 1931—1932.

Receipts:

			Estimates	Actual Receipts
I.	1	Balance brought forward from 1930—31	148 115.50	148 115.50[1])
II.	2.	Annual contributions of the Governments:		
		for 1930—31	157 000.00	82 000.00
		- 1931—32		115 000.00
III.	3.	Interests on Bank deposit	2 000.00	831.18
IV.	4.	— - Treasury bonds	6 000.00	6 000.00
V.	5.	Sale of publications	2 500.00	2 785.73
		Total Kr.	315 615.50	354 732.41

Expenditure:

		Ordinary Expenditure:—	Estimates	Actual Expenditure
I.	1—6.	Incidental expenses	17 000.00	17 000.00
II.	7—11.	Administrative Staff	40 700.00	40 635.00
III.	12.	Expenses of the office in Copenhagen	15 000.00	12 371.20
IV.	13.	Travelling expenses	10 000.00	371.40
V.	14.	Chairmen of Committees	31 000.00	31 000.00
VI.	15.	Printing and distribution	39 500.00	30 565.06
VII.	16.	Transferred to Pension Fund	3 500.00	3 500.00
		Extraordinary Expenditure:—		
VIII.	17.	Special Resolutions of the Council:		
		(a) Chargeable to revenue.		
		Supplementary expenditure for Binding of books	400.00	400.00
		Isotherm charts of the North Sea	500.00	465.50
		Submarine waves in Cattegat and Skagerak	3 500.00	3 500.00
		Honorarium to Professor Henking	3 000.00	3 000.00
		Experiments with Plankton nets	400.00	400.00
		Carbonic Acid researches in Helsingfors[2])	0.00	1 000.00
		(b) Chargeable to reserve.		
		Mrs. Drechsel's pension	6 500.00	6 500.00
		Cost of production of Prof. Joubin's Fiches Faunistiques	9 000.00	9 000.00
		Honorarium to Prof. Joubin for four sets of Fiches Faunistiques	1 000.00	1 000.00
		Liverpool Tidal Institute	2 730.00	2 632.50
		Total Kr.	183 730.00	163 340.66

[1]) + Russia's contribution for 1914/15, **Rbl. 14 430.54,** deposited in a Leningrad bank from which it has not yet been possible to withdraw it.

[2]) Sanctioned by Correspondence.

Receipts	per $^{31}/_{3}$ 1932	Kr. 354 732.41
Expenditure	per $^{31}/_{3}$ 1932	ca. - 163 340.66
Cash balance	per $^{31}/_{3}$ 1932	ca. **Kr. 191 391.75**

Of this Balance there were deposited in Kjøbenhavns Handelsbank, Sparekassen for København og Omegn and cash	Kr. 72 848.32
Danish Treasury Bonds, nominal Kr. 120 000.00 (Market value on March 31st 1932, Kr. 114 000.00) Purchase value	- 118 543.43
	Kr. 191 391.75

All Contributions for 1930—31 have been received. The following countries have not yet paid their Contributions for 1931—32: Great Britain, Finland, the Netherlands, Portugal and Latvia.

Special reserve for pensions:

Danish Treasury Bonds, nominal Kr. 24 000.00, deposited in a box in the bank (Market value on March 31st 1932, Kr. 22 820.00). Purchase value	Kr. 23 645.73
Deposited in Kjøbenhavns Handelsbank	- 159.11
	Kr. 23 804.84

Meetings.

Meetings of the Bureau attended by all members were held in Copenhagen in March 1931 and in Oslo in April 1932.

The working committee consisting of Dr. Kurt Buch, Helsingfors, Mr. H. W. Harvey, Plymouth, and Dr. Herman Wattenberg, Munich, appointed by the Council at the meeting in May-June 1930 to investigate the carbonic acid system in the sea, began its work at the Thalassological Institute in Helsingfors on February 23rd, 1931. Miss Stina Gripenberg acted as assistant. In the programme presented to the Meeting the joint work of the commission was calculated to require about two months. However, certain experimental difficulties, which took some time to overcome, caused a delay, so that at the end of April, when Mr. Harvey was obliged to leave, the work was not finished. It was then continued by the other members of the commission and concluded at the end of May. The experimental work at constant temperature was then ready. A study of the available literature showed, however, that the influence of temperature on the carbonic acid system could not be regarded as sufficiently known, for which reason Mr. Buch in September made this point the object of a special investigation, which was concluded at the beginning of October. The experimental material was worked up by Mr. Buch and Miss Gripenberg, the latter being charged with the calculations and the drawing up of the tables. The report written by Dr. Buch was ready for press in February 1932.

II. Work of the Bureau at Copenhagen.

Besides administrative work, correspondence, etc. the following work has been carried out:—

A. Publications.

Report regarding the publications issued and cost of same during the financial year 1931—32 as per $^{31}/_{3}$ 1932.

Series	Volume and Subject	No. of copies	Cost Kr.	Remarks
Rapports & Procès-Verbaux	LXXIV. Procès-Verbaux	800	4 246.00	
—	LXXV. General Marine Physiology	800	1 399.50	
—	LXXVI. The mixing question	800	1 283.50	
—	LXXVII. Rapport Atlantique	800	1 749.50	
—	LXXVIII. Baltic Report	800	2 512.75	
Bulletins	Bull. Hydrographique 1930	800	4 963.94	
—	Offprints of Bulletin Hydrogr. 1931, March	50	73.76	
—	Offprints, April	50	111.00	
—	— May	30	131.50	
—	— June	50	100.76	
—	— July	50	46.00	
—	— August	50	54.00	
—	— September	50	74.50	
—	— October	50	73.00	
—	— November	50	65.00	
—	— December	50	74.50	
—	— Jan. 1932	50	121.25	
—	— Febr. —	50	73.00	
—	Bulletin Statistique	800	2 300.10	
Journal du Conseil	Vol. VI, No. 2	750	3 929.80	Cost includes fees to contributors, translations, blocks etc.
	Vol. VI, No. 3	750	3 263.60	
			Total... 26 646.96	

Other costs of Publications:—

Distribution	2 551.54
Translations, etc.	1 366.56
Grand Total...	30 565.06

B. Hydrographic Department.

The work on which the Service Hydrographique was engaged during the past year was:

1) Preparation of the manuscript of the Bulletin Hydrographique and publication of proof-prints of the material according to the scheme adopted.

   Material received before the 10th of any month has usually been sent out as proofs about the last day of the same month. Some hydrographical material e. g. the observations from lightships and the observations of sea level have been retained some time before sending out as proofs in order to reduce the costs of the proofs.

2) Publication of the Bulletin Hydrographique for 1930.

3) Elaboration of temperature charts for the North Sea according to the resolution of the Council on this subject (see Rapp. et Proc.-Verb. Vol. LXVI p. 64 Rec. 3).

   The work will be ready for printing at the meeting this summer.

4) The working up of the salinity material in the North Sea has been continued according to the resolution of the Council of last year (see Rapp. et Proc.-Verb. Vol. LXVI p. 64 Rec. 2).

   The work will be so far advanced at the meeting this summer that a decision as to printing may be taken. Some revision of tables and charts will have to be postponed till after the meeting.

5) The Department has assisted in the publication of Rapport Atlantique 1930.

6) As member of the Sub-Committee (Chairman: Prof. B. Schultz, Hamburg) on Submarine Waves in the Kattegat and in the Beltsea (see Rapp. et Proc.-Verb. Vol. LX p. 52, Vol. LXVI p. 64 Rec. 4 and Vol. LXXIV p. 68 Rec. 3) the Hydrographer has taken part in the investigations at sea in August 1931 and in the working up of the material collected from the Danish side.

7) The Department has been in continuous touch with various institutions and persons by correspondence.

   It may especially be mentioned that the Department has assisted in the deliberations and correspondence relating to the Polar Year.

   The Department has assisted in some analyses of the chlorine content of seawater samples sent to the Department.

C. Statistical Department.

The Bulletin Statistique for the year 1929 was published in September 1931 and work on the Statistics for 1930 has been carried on during the year 1931—32. In pursuance of the recommendation of the Statistical Committee in 1931, there have been worked out monthly data and charts relating to the Herring Fisheries during the year 1930 similar to those prepared for 1903. The material for the Bulletin for 1930 has been worked out and tabulated, but as no material from Iceland has been received, it will not be possible to lay proof-prints before the Committee at its next meeting.

Reports of Area Committees.

NORTH-EASTERN AREA
1931.

By

Oscar Sund (Vice-Chairman).

The countries represented on the Committee have through their respective members, been asked to furnish information concerning their investigations relative to our area. It appears from replies received from all the members that "field work" has been carried out or/and papers published by the following countries and institutions:—

Denmark: (Carlsberg Laboratorium).
England: (Ministry of Agriculture & Fisheries).
Germany: (Staatl. Biol. Anstalt, Helgol. & Inst. f. Seef., Wesermünde).
Norway: (Fiskeridirektoratet, Bergen.
Biol. Laborat. of the University, Oslo.
Norges Svalbard- & Ishavsundersøkelser, Oslo.
Tromsø Museum, Tromsø).

It is to be regretted that it has not been possible to obtain information regarding the Russian work in the area in 1931 but an interesting record of the work and results achieved in the preceding year (1930) has been received from the "Goin" or State Oceanogr. Institute, Moscow, and is printed here (as appendix 3 to this report).

Denmark.

The extensive and laborious work of investigating the races of the cod, carried out at The Carlsberg Laboratory by Prof. Johs. Schmidt, was continued and fresh samples have been received. The work continues and will also be extended to the herring and possibly to other species.

An account of the results hitherto obtained has been published: Johs. Schmidt. Racial Investigations. X. The Atlantic Cod (*Gadus callarias* L.) and local races of same. — Comptes-Rendues des Travaux du Laboratoire Carlsberg, 1930.

England.

A limited quantity of market measurements on Barents Sea catches have been made. A detailed report on the investigations undertaken by Mr. J. A. Robertson on behalf of the Ministry of Agriculture and Fisheries is published (as appendix 1 to this report).

Germany.

The Staatliche Biologische Anstalt, Helgoland, and the Institut für Seefischerei, Wesermünde, have continued the market measurements of Barents Sea trawl catches thus supplying a very much needed and invaluable complement to the Norwegian coast measurements, and the naturalist in charge, Dr. Lundbeck of the Institute für Seefischerei also made a voyage of observation in a trawler during the spring of 1931.

As Dr. Lundbeck has prepared a detailed account on the work and the results, printed as appendix 2 to this report, no more need be said here about the very valuable German effort to clear up the problems connected with the increasingly important fisheries in the Barents Sea.

The results of the German work have been made the object of an interesting paper by Dr. Lundbeck, and have recently appeared: Biologisch-Statistische Untersuchungen über die deutschen Barentsmeerfischereien mit besonderer Berücksichtigung von Kabeljau und Schellfisch. (Wiss. Meeresunters., N. F., Abt. Helg., XVIII, 8, Oldenburg, Januar 1932). —

Norway.

Oceanographical Work was carried out in different parts of the N.E. area by different institutions, namely:

in the coastal waters from Stavanger to West Finmark by the Directorate of Fisheries,

at Møre a section from the inner Romsdalsfjord and across the banks out to deep water, repeated 3 (partly 5) times, by Prof. Hjort, for the Biological Laboratory of the University of Oslo.

Fjords and coast of the Tromsø area, 12 stations repeated every month by the Tromsø Museum, a very commendable effort of intensive study of a limited, type area.

Bear Island area. A section of 6 stations by "Norges Svalbard- & Ishavsundersøkelser", 2 sections (16, resp. 14 stations) Finmark—Bear Island and one section N.W. from the island and several shorter sections in the vicinity of the island by the fishing experiment expedition of the Directorate of Fisheries.

Plankton Collections were carried out along with the oceanographical work during the investigations cited above with the exception of the section made by N. Svalb. & Ishavunders., this institution was mainly interested in charting.

Chemical Investigations on the biologically interesting factors were carried out during the University of Oslo's Møre work, during the fjord work of the Tromsø Museum and during most of the cruises organised by the Directorate of Fisheries.

The following is a succinct account of the work accomplished by the several institutions.

1) The University of Oslo. The marine biological investigations in the Romsdalsfjord and off the coast of Møre, organized in 1925 by Professor Dr. JOHAN HJORT, were continued in 1931, with the laboratory at Aukra Whaling Station as a base. This year the following took part in the investigations: Professor Dr. H. H. GRAN, Mr. TRYGVE BRAARUD, Mr. ALF KLEM and Mr. JOHAN T. RUUD.

The investigations were carried on according to the same plans as in the preceding years, based on a series of stations F, A, B, C, D, E and H, along a line running from the inner part of the Romsdalsfjord over the coastal bank to a point 60 nautical miles off the coast and 15 miles outside the edge of the shelf, the "Storeggen".

Four cruises were made in the m.c. "Morild":—

16th—17th March, stations F—E.
20th—21st April, stations F—H.
10th & 22nd June, stations B, C & F.
29th—30th July, stations F—E.

At all stations the following elements were investigated: Temperature, Salinity, p_H, Oxygen, Nitrate, Nitrite, Phosphate, Ammonia, Iron and Silica. Water samples for quantitative determination of phytoplankton were taken in the usual depths from 1 m. to 75 m. below surface, and vertical hauls with the standard net (75 cm. in diameter, silk nos. 8 and 0) were taken in the usual way.

As a result of the previous investigations in this area, the following paper has been published 1931:—

TRYGVE BRAARUD and ALF KLEM: Hydrographical and Chemical Investigations in the coastal waters off Møre and in the Romsdalsfjord. (Hvalraadets Skrifter No. 1. 1931).

2) The Tromsø Museum continued through 1931 a programme begun in 1930 of monthly observation of the different physical and chemical elements at a number of selected spots in the Tromsøfjord system and some on the outer coast. The investigations in 1931 involved 1,110 determinations of S & T, 1,036 of oxygen and 819 of oxygen consumption in darkness after 3 weeks storing of the samples, 985 of phosphates, 721 of nitrates, 1,035 of nitrite and 1,080 of p_H, apart from plankton collection with 3 kinds of nets and in the autumn also seine hauls on the shores for fish fry. This work was carried out every month of the year, sometimes under the most trying conditions, by means of a small cutter of only 38 f. o. a. These investigations were planned in collaboration with the Directorate of fisheries and carried out by the staff of Tromsø Museum under the direction of Mr. SOOT-RYEN.

3) "Norges Svalbard- & Ishavsundersøkelser" carried out the section alluded to above. An account of the expedition is published in The Polar Record (Cambridge), January 1932, p. 6.

4) The Directorate of Fisheries. In the early part of the year the "Johan Hjort" was used for a cruise in the waters south of Bergen when the work had to be abandoned on account of the detection of rot in the hull which eventually had to be

replaced. This was done in the remaining part of the year and the rejuvenated vessel is not only a little larger (78 by 16 f. from 68 by 15) but also more seaworthy and serviceable. The space available now allows sufficient room for titrations and other determinations to be made on board immediately. There is accommodation for five besides the ordinary crew.

As a substitute the cutter "Pretoria" (62 f. long) was fitted with a deck house and most of the usual working programme of the "Johan Hjort" was carried out, except the spring cruise in the Finmark waters and the late autumn cruise along the coast from Bergen to W. Finmark, planned to study the conditions just before the migration of the "skrei" or spawning cod.

The oceanographical and plankton work by means of the "Johan Hjort" and the "Pretoria" along the Norwegian coast comprised the following cruises and approximate number of observations: —

Cruise	Area	Time	In charge	Stt.	S & T	O_2, P, NO_3, p_H
I.	Bergen—Stavanger	$^{21}/_{1}$—$^{14}/_{2}$	Runnstrøm	29	300	70 of ecah
II.	Bergen—Lofoten	$^{14}/_{3}$— $^{6}/_{5}$	Sund	127	800	600 - —
III.	Bergen—Stavanger	$^{9}/_{5}$—$^{16}/_{5}$	Bjerkan	21	200	60 - —
IV.	Bergen—W. Finmark	$^{20}/_{7}$— $^{9}/_{8}$	Runnstrøm	Young fish invest.		
V.	W. Finmark—Bergen	$^{10}/_{8}$— $^{3}/_{9}$	— and Sund	54	600	300 - —
VI.	West Coast	$^{8}/_{9}$—$^{24}/_{9}$	Bjerkan	37	400	200 - —

The mixed fishing trial and oceanographical expedition to northern waters under the leadership of Dr. Thor Iversen was made in the hired steam liner "Sotra". This expedition was chiefly concerned with fishing experiments, mainly with long lines with which gear 89 hauls were made, Honningsvåg in N. Finmark serving as a base for bait and supplies. In addition to this work 135 oceanographical stations were made involving 921 observations of T & S. Some Samples for nitrate and phosphate were also collected.

Marking of Fish. Three small marking experiments were made in 1931. 1) On the fishing ground Gjesbåen—Lopphavet in W. Finmark 800 cod of skrei size were marked in January—February when they were supposed to be on their way to the spawning banks. So far only very few of these fish have been recaptured. 2) During the "Sotra"-expedition 192 halibut were marked in the vicinity of Bear Island. Of these 5 were recaptured near by but 2 were caught on the Finmark coast in the autumn, thus demonstrating the possibility of long migrations by the halibut also. 3) Near Kristianssund (Møre) 450 young saithe were marked in June in continuation of the marking experiment made in Northern Norway in 1921.

Fish Population Records. The most important food fish, especially cod, herring, sprat and haddock were investigated on a similar plan and scale as in 1930. Some remarks on the 1931 results as to the cod will be found as appendix 4 to this report.

Russia.

No direct information has been received regarding the Russian work in the Barents Sea in 1931 but it appears from different sources that the lines of work followed in 1930

(mentioned in the preceding N.E. area report) are being kept up without important alterations, by means of the numerous staff and with the formerly independent biological station of Aleksandrovsk (now Polarnoe) as the working base of the "Goin" or central Oceanographical Institute, the headquarters of which are at the Zoological Museum in Moscow.

A detailed account of the work in 1930 has been received and is included in this report as appendix 3.

It appears from the above statement that a great deal of work is now being of immediate or ultimate importance in connection with the fisheries of one of the most productive fishing regions in the world. The needs which seem most apparent to the writer are: 1) More detailed investigations concerning the transport of fish fry from other regions into the vast feeding grounds of the Barents Sea. It is at present impossible to form a clear idea of how, for instance, the haddock and plaice populations of the Barents Sea maintain themselves. The former, which exhibits an undiminished abundance seems to depend on fry from the Norwegian coast or even the North Sea, while the latter, which is believed to propagate in the Barents Sea has lost its former predominating importance to the trawlers. 2) The exact nature of the exchange of water between the Barents and the Norwegian Seas is very imperfectly known although admittedly of prime importance to an understanding of the questions just mentioned and of the nature of the yearly migrations of the cod, saithe etc.

APPENDIX 1.

A Cursory Survey of the Bear Island Trawling Ground.

By

J. Armitage Robertson, M. A. Fisheries Laboratory, Lowestoft.

Introduction.

The voyage which is here described was undertaken in accordance with an arrangement made at the meeting of the North Eastern Area Committee on 28th May, 1930 (Rapp. Proc.-Verb., Vol. LXVI, p. 36, 1930).

I left Hull on 15th July, 1930, aboard the commercial trawler "St. Rose" for the recently exploited trawling ground near Bear Island, which we reached on 21st July. We returned to Hull on 3rd August after spending seven and a half days (21st—28th July) on the trawling grounds. In this time all the vessel's holds had been filled with fish, the total catch amounting to about 130 tons, together with 50 barrels of fish-livers.

Observations were made on forty one out of a total of about sixty trawl hauls and the particulars are incorporated in Table 2. The quantity of cod is given in baskets (containing 6 stone or 38 kg.) and was usually estimated rather approximately by the skipper or mate. In the case of other species the quantity is recorded as baskets, or number of fish, or sometimes, with less accuracy, as "a few" or "several". The rough nature of these estimates is unavoidable on a commercial vessel and I relied upon the experience of the skipper in estimating quantity as I was fully occupied in measuring. fish and collecting material.

Inspection of Table 2 will reveal large variations in the quantity of fish caught in different hauls. Although it seemed as if the best catches were made at "night" I can find no obvious relation between the quantity of the catch and either the time of day or the surface temperature. When the fishing was good quite short hauls of an hour or less would produce 100—200 baskets and an enormous heap of cod would accumulate on deck, reaching, in places to above the level of one's knees. When the fishing was relatively poor the hauls still produced quantities which would probably be considered distinctly profitable in the North Sea.

The distances and bearings from Bear Island were also obtained in most cases from the skipper or mate, as it is difficult to estimate the distance and the exact bearing from a particular point on land without considerable experience. All bearings were taken from Cape Bull which is the southernmost point of Bear Island. At many stations and often for long periods the island was completely hidden by fog, which accounts for the vagueness of some of the positions recorded, but our position was verified whenever the island became visible.

The gear used at Stations 1—12, 17 and 19—41 was a Granton Otter-trawl modified with cables so as to resemble the Vigneron-Dahl trawl, but with small auxiliary doors substituted for the "dan-lenos". At Stations 13—16 and 18 an ordinary Granton Trawl was used. Both types of gear were equipped with large wooden "bobbins" in the bosom of the foot-rope although the ground did not appear to be foul. A certain amount of Polyzoan coralline occurred, however, and the bobbins showed distinct signs of wear at the end of the voyage.

I made two kinds of hydrographical observations; firstly I took a series of fifteen surface-water samples with concurrent temperature observations, and secondly I observed the surface temperature after each trawl haul and the bottom temperature when I was able to do so. Surface-water was obtained simply by means of a galvanized iron bucket attached to a rope. At each station from which a surface sample was taken two bottles were filled, to one of which I added 1 cc. of concentrated $HgCl_2$ (corrosive sublimate) in order to preserve it for subsequent nitrate determination. The surface temperatures were taken to the nearest 0.05° C. with an ordinary surface thermometer reading to 0.1° C., while the bottom temperatures were taken with a reversing thermometer attached close to the bottom of the lead-line. I had great difficulty in working the latter instrument owing to the "messengers" (for releasing the trigger-mechanism) jamming fast on the twine depth-marks on the wire lead-line. Eventually a heavy warp-shackle was successfully used for this purpose, but in consequence of this difficulty the number of bottom

temperatures, seven in all, is very meagre. The reversing thermometer was equipped with an auxiliary thermometer giving the air temperature at the time of reading. Unfortunately it was of an old pattern and the particulars necessary for applying the correction for air temperature were not available, but some tests which I have made indicate that this error is not likely to exceed 0.1° C., but more often approximates to 0.05° C., within the range of air temperatures encountered.

Economy of time is essential if this rich but remote fishing ground is to be exploited to full advantage, and the crew accordingly worked with astonishing energy and endurance. They had intervals for food but scarcely any for sleep, nevertheless they were always willing to give me help if I needed it, and I wish to express my thanks to Captain Lead and to the members of his crew for their very welcome help and kindness. I am also greatly indebted to Messrs. T. Hamling and Company for permitting me to sail in their vessel.

History of the Fishery.

The history of the Bear Island grounds as a trawling area is very short for it was only in 1928 that British trawlers first visited this region. It is probable that Norwegian line-fishermen have occasionally sampled these grounds, and various scientific expeditions have caught fish in this area, but it seems that few large catches of common food-fishes have been recorded. Hartlaub (1900) reports that the "Olga" made a fairly large haul of 800 kg. (about 15 cwt.) of cod to the north west of Bear Island, and he also records lesser catches of 300 kg. of cod further south, and two more northerly catches of 250 kg. of cod, and 400 kg. of cod with 250 kg. of haddock. These stations lay close to the hundred-fathom line or within it, and the gear employed was a trawl. "Die dicht beieinander gelegenen Stationen westlich von der Bäreninsel erwiesen sich als äusserst fischreich. Viele Centner Kabeljau und grössere Schellfisch wurden erbeutet". Iversen's report on his fishing experiments in northern waters in 1923 makes no mention of Bear Island, but he made two considerable catches of cod with lines to the east and south east of Hope Island. He made, however, a series of successful fishery experiments with lines in the Bear Island area in the Spring and Summer of 1930, the results of which were telegraphed to the Fiskeridirektøren and were published almost immediately in their journal "Fiskets Gang" (cf. Nos. 18—21, 23, 25, 26 and 30; 1930) as an assistance to Norwegian fishermen. British trawlers were by that time visiting the Bear Island grounds.

Figure 1 gives the number of landings, quantity of fish landed and quantity of fish caught per hundred hours fishing for each month from 1928 to 1931 and illustrates the rise and fluctuations of the British fishery at Bear Island. The first few voyages to these waters were made in the early autumn of 1928 but the experiment was not repeated till June 1929, since when the fishery has been continuously prosecuted except in the month of April when the closure of ice round the island puts a stop to trawling. It is very evident that the fishery expanded greatly in 1930 as compared with 1929, as may be seen from the graphs for the number of landings and for the quantity of fish landed. Unfortunately during the present summer (1931) economic circumstances have compelled

the trawler-owners of Hull, which is the port chiefly interested in the fishery, to abandon these grounds. It is to be hoped that this need only be a temporary measure[1]). The graph for catch per 100 hours fishing shows that there is some seasonal fluctuation in the stock, minimal catches occurring in September and October both in 1929 and 1930, yet the graph for quantity landed does not follow this graph but runs *pari passu* with the graph for the number of voyages. Indeed, the close similarity between the course of the graphs for number of landings and for quantity landed is probably typical of a virgin fishery where there is always an excess of fish available even in times of relative scarcity and where the intensity of fishing has not yet reached its utmost profitable limit.

The fishery shows some signs of being affected by the relative scarcity of fish in September and October 1929, for the number of voyages decreases but does not reach its lowest level until November when the average catch has begun to rise again. In 1930 this agreement between the two graphs does not occur. It seems that there was plenty of fish available even when a decrease in abundance forced the trawlers to spend more time in catching it.

At the time I visited these grounds the fishery was mainly carried on by British trawlers from Hull and Grimsby, but vessels of other nationalities were also fishing there, notably German trawlers and Norwegian liners.

From the German Fisheries Report for 1930 it appears that German vessels began to fish the Bear Island grounds in June of that year, but the total number of voyages during the year amounted only to seventy one. As in the case of the English Statistics, the quantity landed follows the number of landings (voyages) closely and shows no primary dependence upon the catch per day's absence from port. The quantity landed and the number of voyages reach their maxima in July — a month earlier than in the English fishery — then show a decline in the following month (as do the English Statistics), followed by partial recovery in the autumn and finally by a drop as the winter begins. The whole fluctuation is not dissimilar to that shown in Figure 1, but each stage occurs a month earlier.

The German catch per day's absence resembles the English catch per 100 hours

[1]) Since this was written the fishery at Bear Island has revived, as is shown by the following figures for all ports.

1931	No. of Landings by Steam Trawlers	Total quantity landed in cwts.	Catch per 100 hrs. fishing in cwts.
July	18	30,708	1,916
August	25	48,737	1,977
September	53	90,012	2,036
October	75	127,069	1,772
November	106	198,709	1,950
December	110	178,047	1,995

No fish were landed in Hull from Bear Island during August but since that month it has resumed its former position, the other chief port concerned being Grimsby.

The average catch remains at a steady and somewhat low level from July to December with a very slight fall in October. Nevertheless, the number of voyages and quantity of fish landed increase steadily together.

fishing in displaying low values in September and particularly in October, with a subsequent rise, but the German figures show a marked and continuous increase in average catch from June to August, which is not apparent in the English statistics for 1930 although it is faintly indicated in 1929.

Position, Hydrography, Climatic Factors.

Bear Island lies eight degrees within the Arctic circle in 74°25′ N. Lat. and 19° E. Long., about half way between Finmark and Spitzbergen and over 1300 miles from the

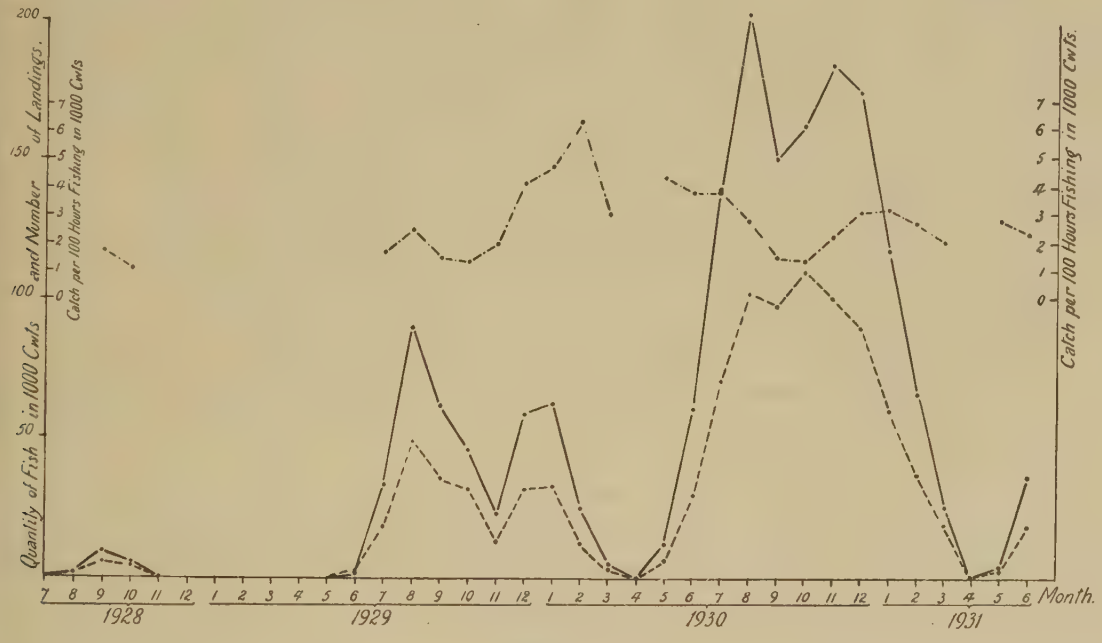


Figure 1.

——— Total quantity of fish landed in England and Wales by Steam Trawlers and Steam Liners from the Bear Island Grounds, 1928—1931.

— — — — Number of Landings by Steam Trawlers and Steam Liners from Bear Island Region, 1928—1931.

—·—·—· Catch, per 100 hours fishing, of demersal fish landed by Steam Trawlers from Bear Island.

Humber. The island is situated on the southermost promontory of the great Spitzbergen Bank, on which Hope Island also lies. This bank slopes down within a short distance west of Bear Island into the depths of the Norwegian Sea, while to the south and east it is bounded by the relatively deep Bear Island Channel, which runs northwards and eastwards into the main basin of the Barents Sea. The 100 fathom line sweeps round, within about thirty miles of the island, in a southerly curve from northwest to southeast, and the chief trawling grounds lie on this relatively shallow shelf area.

The mean southerly limit of drift ice in winter and spring lies slightly to the south of Bear Island, although sometimes for considerable periods the ice may not extend

Table 1. Surface-water observations. Bear Island.

Station No.	Date 1930	Hour G.M.T.	Latitude N.	Longitude E.	Temp. °C.	Salinity ‰	P mg./m.³	N mg./m.³
1	VII. 20	1900	72°24′	17°57′	9.60	35.24	0	15
2	— —	2000	33′	18°03′	.55	.02	0	15
3	— —	2100	43′	08′	.85	.00	2	8
4	— —	2200	53′	15′	.65	.17	2	10
5	— —	2255	73°05′	23′	.50	.12	8	15
6	— —	2355	13′	30′	8.80	.17	2	30
7	— 21	0050	23′	38′	9.15	.08	0	15
8	— —	0145	33′	44′	.05	.10	10	25
9	— —	0240	43′	50′	6.40	.06	2	8
10	— —	0340	53′	58′	5.45	34.64	0	8
11	— 26	0950	74°31′	17°38′	.85	.95	4	15
12	— 27	1100	28′	35′	.65	.91	18	15
13	— 28	1415	29′	26′	6.15	35.08	2	7
14	— —	1910	04′	08′	8.65	.12	28	20
15	— —	2130	73°41′	16°43′	.30	.15	9	30

1 mg. P = 2.3 mg. P_2O_5.
Determinations made 30th August—5th September, 1930.
Determinations of Salinity by Kr. Wilhelmsen, those of Nitrate and Phosphate content by Oscar Sund.
Observations by J. A. Robertson.

as far south as the island. In summer the island is almost invariably ice-free owing to the relatively warm water of the Atlantic Drift which strikes and surmounts the western slope of the Spitzbergen Bank and flows through the Bear Island Channel into the Barents Sea. In this area cold water flowing southwards and westwards from the Polar Sea and the eastern parts of the Barents Sea meets the warmer Atlantic Drift and forms a border region of mixed water (cf. Schulz and Wulff p. 256).

The practically continuous fog which we experienced bore witness to the meeting in this region of warm and cold air, presumably accompanying water masses of corresponding temperatures. Poor visibility owing to fog is reported to be customary during the summer months and is apt to hinder navigation. No icebergs were seen during this voyage although one was observed about a month earlier by Mr. F. Jenkins of Lowestoft. Naturally, during the summer the daylight is continuous in so high a latitude, but in winter it is almost continuously dark which must add considerably to the rigours of the fishery.

Data and Observations.

(a) Hydrography.

A series of ten salinity samples was taken between the Lofotens and Bear Island at approximately ten mile intervals during the outward voyage, while three further samples were taken north west of Bear Island and two final samples were obtained at

twenty-five mile intervals during the homeward voyage. The positions of these samples are shown on the chart and are also given in Table 1 together with salinities, nitrate and phosphate contents, temperatures, and other relevant details. For many of these particulars I am indebted to Mr. Oscar Sund, who was kind enough to analyse the water samples.

In the chart on p. 124 I have attempted to indicate approximately the course of the isotherms of 6° C. and 9° C. and the isohalines of 35.00 ‰ and 35.10 ‰. The isotherm of 6° C. and the isohaline of 35.00 ‰ appear to be more or less coincident, but the former is probably somewhat irregular, as reference to the surface temperatures recorded after each trawl-haul (Station list — Table 2) will show. For the sake of clarity I have only plotted in the chart those stations from which both salinity and temperature observations are available, since there are forty surface temperature observations in close proximity to each other near Bear Island.

The surface temperatures on the fishing grounds (Table 2) range from 3.05° C. to 7.20° C. and often show considerable variations between consecutive hauls, in some cases by as much as two degrees. On the whole it may be said that during the latter half of the period under consideration the temperature at the surface was higher and fluctuated less markedly than in the earlier half — a circumstance which is most clearly apparent if the temperature curve be plotted against time. Since we moved slowly and progressively round the island from south to west-north-west in the course of trawling (cf. positions in Table 2), these higher and more stable temperatures occurred on the westerly side of the island in the region that is probably influenced most directly by water of Atlantic origin.

My observations of surface temperature are somewhat higher than those recorded by Schulz and Wulff (1929) on 9th September 1927, due north and south of Bear Island (i.e. 2.02° C.—2.58° C. at their Stations 88—90). The same is true of my salinity observations, for the water samples taken within the 100 fathom line (Hydrographic Samples 10—13) show a range of 34.64 ‰ to 35.08 ‰ while Schulz and Wulff's observations vary between 33.39 ‰ and 33.89 ‰.

Only seven bottom temperatures were taken, of which the first at Station 2 to the south of the island was much the lowest (1.5° C.). The more westerly stations showed bottom temperatures ranging from 2.6° C. to 2.95° C. at depths of 72 to 90 fathoms. These latter bottom temperatures resemble those found by Schulz and Wulff at comparable depths at Stations 86 and 91, and also on the bottom (but at lesser depths) at Stations 88 and 89, whereas temperatures of 1.86° C. and —0.06° C. occurred on the bottom at their Stations 87 and 90. So far as they go, my observations of bottom temperature agree with those from the surface water in showing a higher temperature on the western than upon the southern side of Bear Island. Making full allowance for any error or inaccuracy my bottom temperatures may be considered correct to $^1/_4$° C. at least.

(b) Fish Taken in the Trawl.

Medium sized Cod formed an overwhelming proportion of the catch in almost every haul. Small and medium sized Halibut were fairly plentiful and there were a few

Table 2. Bear I

Station	Date	Position (approximate)	Time of shooting G.M.T.	Duration of Haul Hrs. Mins.
	July 1930			
1	21st	About 26 miles S. of Bear Island	0400	1 45
2	21st	ditto — towing W.S.W.	0640	2 00
3	21st	Towing W. from Station 2	0930	2 45
4	21st	18—20 miles S.W. of Bear Island (towing southerly)	1245	1 45
5	21st	S.W. of Bear Island	1515	2 45
6	21st	ditto	1830	2 30
7	22nd	S.W. by W. of Bear Island	0540	1 30
8	22nd	About 23—25 m. S.W. by W. of Bear Island[1])	0845	1 25
9	22nd	S.W. by W. of Bear Island	1115	1 00
10	22nd	ditto	1300	1 10
11	22nd	ditto	1455	1 20
12	22nd	ditto	2145	1 15
13	23rd	ditto	0530	2 00
14	23rd	ditto	0815	1 35
15	23rd	ditto	1030	2 30
16	23rd	ditto	1335	2 05
17	23rd	8 miles N.N.W. of last position[2])	1630	0 45
18	23rd	ditto	2245	0 30
19	24th	ditto (approximately)	0910	0 45
20	24th	ditto (approximately)	1800	0 30
21	24th	ditto (approximately)	1915	0 45
22	24th	ditto (approximately)	2040	1 15
23	24th—25th	Towing N.N.W. from last position[3])	2245	1 25
24	25th	Position as at Station 23 (at dan-buoy)	0855	1 30
25	25th	ditto	1120	2 00
26	25th	ditto (approximately)	1900	1 15
27	25th	ditto (approximately)	2105	1 00
28	25th	20—25 miles W.N.W. of Bear Island as in Stations 17 to 27	2245	1 10
29	26th	25 miles N.W. by W.$^1/_2$W. of Bear Island	0835	1 00
30	26th	ditto	1030	1 10
31	26th	ditto	1235	1 30
32	26th	ditto	2150	1 15
33	27th	W.N.W. of Bear Island (about 4 miles N.N.W. of Station 32)	0630	1 10
34	27th	About 25 miles W.N.W. of Bear Island	0940	1 00
35	27th	ditto	1345	1 15
36	27th	ditto	1550	About 1 30
37	27th	ditto	1800	1 15
38	27th	ditto	2010	1 30
39	28th	27—28 miles W.N.W. of Bear Island	0925	0 55
40	28th	ditto	1240	1 15
41	28th	As in Station 40, but closer to Bear Island in shallower water	1430	1 05

[1]) Fishing round a dan-buoy at Stations 8 to 11. No soundings were taken.

[2]) Fishing round a dan-buoy at Stations 17 and 18; broke adrift at Station 19, was renewed at Station 20 and removed after S

[3]) Fished round a new dan-buoy at Stations 23 and 24, when dan-buoy was removed.

[4]) Where there was a sounding both at shooting and hauling the soundings are given in that order.

[5]) Both thermometers gave same reading.

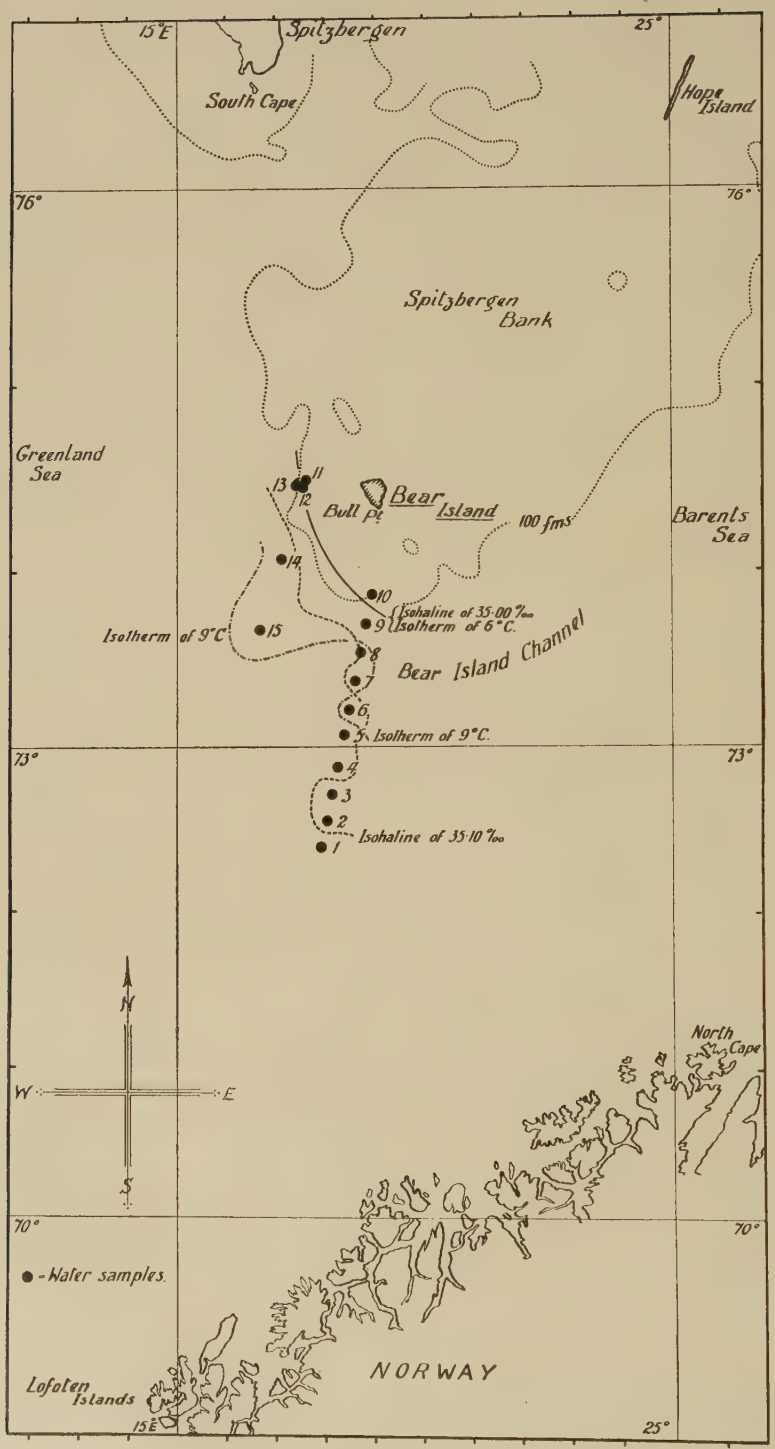
[6]) A few minutes later both surface thermometers agreed at 6.3° C.

[7]) Long-rough-dabs also occurred in previous hauls.

List.

e (°C.)	Approximate Quantity of Fish Caught F = Fish B = Basket					
Surface	Cod (in baskets) FH = Foul haul S = Split net	Haddock	Halibut	Spotted Catfish	Norway Haddock	Other Species
..	$1^1/_2$	..	1 F	1 B	..	1 blue catfish
6.40	15	..	..	1 B	..	
5.70	35	A few	1 F	..	..	
7.10	40	..	..	About 1 B	Numerous	
4.50	80	..	..	About 8 B	Numerous	A few blue catfish
3.90[5])	25	..	Several	About 2 B	A few	Several long-rough-dabs[7])
4.15	100 A	..	3 F	Very few	..	
4.70	(S) 30	1 or 2 F	4 or 5 F	A few	..	A few saithe
4.70	70	..	2 or 3 F	A few	..	
3.35	70	..	1 F	About $^1/_2$ B	..	
3.60	5	1 or 2 F	1 F	Several	A few	1 or 2 saithe
5.45	(S) 30 B	..	..	..	..	
3.05	(FH) 20	..	About 6 F	A few	..	
3.85	5	..	2 F	2 or 3 F	..	
5.45	30	$^3/_4$ B	1 F	..	..	
4.20	50	A few	..	A few	A few	A few saithe and L. R. dabs
3.50	200—250 C	A small %	..	..	..	A small % of saithe
5.00	25 D	..	..	..	..	1 Greenland shark
5.65	15	..	..	..	1 or 2 F	
4.70	30 E	A few	..	..	..	
4.15	50	1 or 2 F	7 F	A few	..	
5.30	30	A few	2 F	2 or 3 F	..	2 blue catfish
5.20[5])	80 F	A few	8 or 9 F	A few	..	
6.20	10	A few	4 F	2 B	..	1 Greenland shark, 6 blue catfish, 1 saithe
5.70	(46 fish)	A few	4 F	11 F	..	1 or 2 blue catfish, 4 common catfish
6.15	25	A few	About 7 F	2 or 3 F	..	1 blue catfish, 1 lumpsucker
6.10	40	..	3 F	1 or 2 F	..	
7.20	60 G	About 2 B	3 F	1 or 2 F	..	
5.85	100	5—10 B	3 large F, sev. small	A few	..	1 or 2 saithe
5.90	25	A few	..	..	..	A few L. R. dabs
6.00	50	A few	1 or 2 F	..	..	
6.10	20	Several	2 F	Several	..	A few saithe, some L. R. dabs
5.85	100	About 5 B	3 or 4 F	2 or 3 F	..	A few saithe
5.65	150	3 or 4 B	..	..	..	
5.90	50	About 2 B	..	7 or 8 F	..	
5.95	70	About 6 B	2 F	About 12 F	..	A few saithe. About 6 blue catfish
5.85	80	1 or 2 B	1 F	Several	..	A few saithe
5.70	50 H	About 3 or 4B	..	Several	..	A few saithe and L. R. dabs
3.55	100	1 or 2 B	..	1 or 2 F	1 or 2 B	1 or 2 blue catfish
6.15[6])	80	1 or 2 F	4 F	A few	..	Several blue catfish
6.05	A large haul 50—100 B?	"occasional"	..	..	..	

etween Stas. 6 and 7 there were two hauls of 120 and 150 baskets respectively.
etween Stas. 12 and 13 there were three hauls of 10, 3 and 0 baskets.
llowed by a 20 min. haul of 50-60 baskets. The net was split.
etween Stas. 18 and 19 there were four hauls resulting in about 100, 30, 250 ? baskets, and a haul with a "split" in the trawl.
haul between Stas. 19 and 20 gave 30 baskets of cod in 35 mins. The net was split.
etween Stas. 23 and 24 there were about three hauls — the fishing was good.
etween Stas. 28 and 29 there were four hauls of 50, 50, 120 and 120 baskets.
etween Stas. 38 and 39 there were two hauls of 100 and 60 baskets; between Stas. 39 and 40 there was also an additional haul.


15° E
Spitzbergen
25°
South Cape
Hope Island
76°
76°
Spitzbergen Bank
Greenland Sea
Bear Island
Bull Pt.
100 fms
Barents Sea
Isohaline of 35·00 ‰
Isotherm of 6° C.
Isotherm of 9° C.
Bear Island Channel
Isotherm of 9° C.
73°
73°
Isohaline of 35·10 ‰
N
W
E
S
North Cape
70°
70°
● - Water samples.
NORWAY
Lofoten Islands
15° E
25°

very large specimens. Haddock, though never very plentiful, occurred sporadically in the first half of the trawling period and more regularly, and in greater quantity, in the latter half when we were upon the more westerly grounds. Saithe (Coalfish) appeared in small numbers in a good many hauls. Spotted Catfish (*Anarrhichas minor*) formed, consistently, a small percentage of the catch and were sometimes accompanied by Blue Catfish (*A. latifrons*) while at Station 25 I recorded the presence of four "Banded" Catfish which were presumably *A. lupus*. The Spotted Catfish were almost entirely very large specimens, in fact too large to measure on a metre measuring-board. The Blue Catfish were discarded as useless, and other species which were thrown overboard were Norway Haddocks (*Sebastes marinus*) and Long Rough Dabs (*Hippoglossoides platessoides*). The former occurred in numbers only when we touched the hundred fathom line at Stations 4 and 5, but the latter were often present in the catch and many of them were of a size considerably greater than that attained by North Sea specimens. We also took a couple of Greenland Sharks, a single Lumpsucker (*Cyclopterus lumpus*) and sometimes a few Rays, which were, I believe, the Starry Ray (*Raia radiata*).

I measured a total of 2,189 Cod and took scale-samples from 382 of them. This number, though not apparently very great, represents almost 6 % of the total catch or the handling of about 7 tons of fish, which naturally involved considerable expenditure of time. I was fortunate enough to secure the services of a boy, who was a passenger, as my recorder, and this enabled me to deal with more fish that I could otherwise have managed. I also measured and took scale-samples from 80 Haddock.

Figure 2 shows the polygon for the length frequency-distribution of all the cod measured together with the equivalent polygon for haddock, while Table 3 gives the data from which they were derived.

The cod show a major mode at about 72.5 cm. and a minor mode at 42.5 cm., while lesser prominences on the polygon at 52.5 cm., 62.5 cm., and 92.5 cm. may indicate the presence of additional modes. This polygon agrees reasonably well with Sund's (1930) curves for length-distribution of Finmark cod in the combined years 1913—1928, and also in many of the years separately (cf. Sund's figures 2 and 3). The Bear Island Cod show the minor mode at about 40 cm. more markedly than is usual in the Finmark fish, which perhaps in 1913 show the closest general resemblance to the Bear Island measurements.

In a paper on market measurements of Barents Sea fish Lundbeck (1930) states that the Cod from Cape Kanin are of medium size and resemble the Finmark "Loddetorsk", but that fish from the Skolpen Bank in summer are larger, resembling Norwegian "Skrei"; in the winter, however, they are smaller than Cape Kanin Cod. He has been kind enough to send me particulars of his market measurements of cod from these two localities in October—December, 1929 and 1930, and also of cod from Bear Island in July—August and October—December, 1930. In the figure given in his paper the Cape Kanin cod have a modal length at about 70 cms. while the measurements, which he sent me, of cod from this region have modal lengths at approximately 80 cms. in 1929 and a few centimetres higher in 1930.

The length-distribution of my Bear Island Cod resembles that of the fish from

Cape Kanin far more closely than it does that of the cod from the Skolpen Bank either in summer or in winter, but the minor modes which my measurements display suggest the presence of a certain proportion of fish such as this latter ground carries.

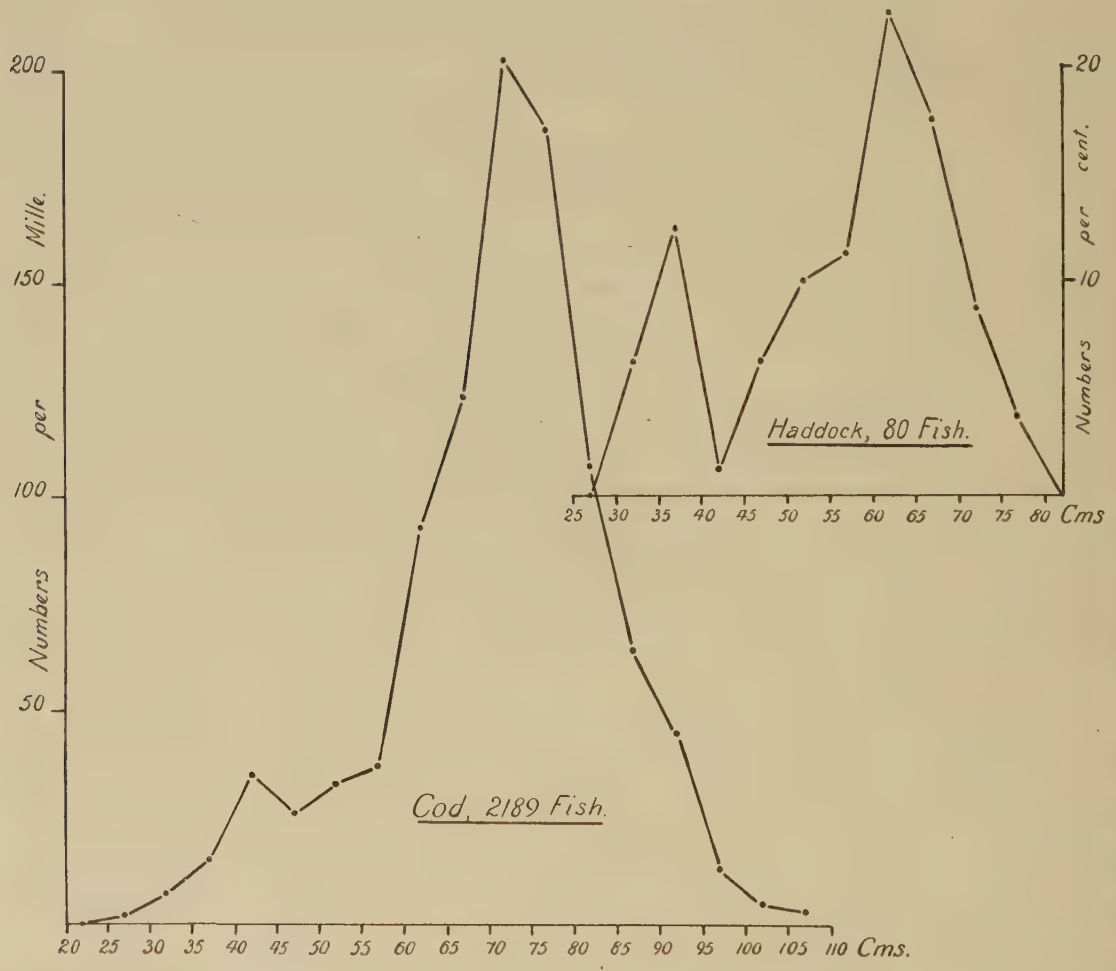


Figure 2.
Length frequency-distribution of Cod and Haddock (in 5 cm. groups) from Bear Island, July 1930.

Lundbeck's measurements of Bear Island Cod in July and August, 1930 (i.e. at the same time as my measurements) have a slightly lower main mode at 68 cms. than mine at 72.5 cms. and do not contain so many fish below 55 cms. Curiously enough his measurements in October to December have a length-distribution resembling mine much more closely, the main mode being at 73 cms. with a pronounced minor mode at about 53 cms.

Through the kindness of Mr. Oscar Sund I have been furnished with photographs

Table 3. Length Frequency-distribution of Cod and Haddock. Bear Island. July 1930.

Length in cms.	Cod		Haddock	
	Nos.	Nos. ‰	Nos.	Nos. %
15— 19	1	..	..	..
20— 24	1	..	..	..
25— 29	5	2	..	..
30— 34	16	7	5	6.25
35— 39	32	15	10	12.50
40— 44	77	35	1	1.25
45— 49	56	26	5	6.25
50— 54	73	33	8	10.00
55— 59	82	37	9	11.25
60— 64	204	93	18	22.50
65— 69	269	123	14	17.50
70— 74	443	202	7	8.75
75— 79	408	186	3	3.75
80— 84	235	107	..	..
85— 89	140	64	..	..
90— 94	98	45	..	..
95— 99	28	13	..	..
*100—104	11	5	..	..
*105—109	7	3	..	..
*120+	3	1	..	..
Total...	2,189	..	80	..

* Approximate lengths only, as the measuring board was 1 metre in length.

of sample scales which I took from the cod, but, owing to the ambiguity attached to reading the scales of cod over the age of three years, age-determination has not been attempted. The photographs are, however, available for examination if required.

The polygon for Haddock (Figure 2) shows major and minor modes at 62.5 cms. and 37.5 cms. respectively, with indications of an intermediate mode at about 50 cms. Fish belonging to the two upper length-modes seem to agree in size with the haddock from the Barents Sea (Skolpen Bank and Cape Kanin) measured by Lundbeck (1930).

From age-determinations kindly made by Mr. Oscar Sund it is apparent (Table 4) that the mode at 37.5 cms. is mainly due to three and four year old fish, while older fish, up to the age of ten years, fall within the upper length-range, as do also some of the four year old fish, which correspondingly show a bimodal distribution. These haddock come from three Stations (Stations 15, 33, 34) and, on analysis, it is evident that fish of less than 45 cms. come almost exclusively from Station 15, at which station alone three year old fish were taken. The age-composition of the total sample from all three stations is given in Table 4 and seems to indicate that the seven and ten year old fish belong to relatively richer year-classes than do the rest.

Table 4. Age and length of Haddock. Bear Island. July 1930.

(Doubtful age-determinations excluded.)

Age in years	2	3	4	5	6	7	8	9	10
Length in cms.									
30—34	..	4	1	..	..	..	..	..	..
35—39	1	4	4	..	..	..	..	..	..
40—44	..	..	1	..	..	..	..	..	..
45—49	..	..	4	..	1	..	..	..	..
50—54	..	..	2	3	2	..	..	..	..
55—59	..	..	1	5	2	1	..	..	..
60—64	..	..	..	2	2	5	2	2	2
65—69	..	..	..	1	2	2	2	1	3
70—74	..	..	..	..	..	1	2	..	1
75—79	..	..	..	..	..	..	1	1	..
Total...	1	8	13	11	9	9	7	4	6
%...	1.5	11.8	19.1	16.2	13.2	13.2	10.3	5.9	8.8

(c) Maturity, Condition and Food of the Fish taken.

Some cod gonads were preserved at Station 5 and they show that the fish were probably "recovering spents", although it is possible that they may have been virgin fish. These gonads were representative of the condition of the gonads seen throughout the trip; actual notes of the occurrence of fish with "recovering spent" gonads were made at Stations 8 and 22.

Throughout the voyage the cod appeared to be in good and fat condition with rather pale skins. So fat were they that the skipper complained that they would not keep very well in the ice.

Samples of the contents of cod stomachs were taken at Stations 1, 7, 15, 22 and 33. Similar samples from haddock were taken at Stations 15 and 33 and from Spotted Catfish at Station 10.

The cod were feeding almost exclusively on an Euphausiid — *Thysanöessa inermis* (Kröyer) — with an occasional Amphipod, of the species *Parathemisto abyssorum* Boeck, among them. Dr. Isabella Gordon, who kindly confirmed my identification of *T. inermis*, tells me that they are almost entirely females. On occasions the cod were packed with this "Krill" and vomited it in great quantity all over the deck. They seemed to feed on nothing else; one could not fail to notice the nature of their food owing to the caution with which one invariably had to walk in order to avoid sitting down among the half-digested Krill. In the condition in which they were disgorged from the cods' stomachs these Euphausiids were most beautiful objects owing to the bright blue-green colour of their liver seen through the thorax. They lose this tint and become pink coloured in formalin.

In the stomach contents of cod from Station 15 a recognisable specimen of the crab *Hyas araneus* was found and digested remains (of what I take to be the same species)

in some of the other samples, but never in any quantity. It may be remarked that the sample from Station 15 was a very poor one, the stomachs were practically empty, containing a few *Thysanöessa inermis* but apparently no *Parathemisto abyssorum.*

The haddock were also feeding on Krill but appeared to vary their diet with bottom living animals.

The spotted catfish contained Echinoderms, largely Ophiuroids, and other benthos, but one or two had eaten fish guts thrown overboard from a trawler and one contained a small fish, possibly a young codling. At Station 1 I noted that a blue catfish contained a quantity of Medusae or Ctenophores but unfortunately did not preserve a sample.

At Station 9 an enormous cod of some five feet in length was caught, which contained several codling of considerable size, perhaps 50 cms. long, besides other fish remains, while at Station 23 a very large halibut was found to contain a half digested fish of about 70 cms. in length, which was probably a catfish.

It is worth remarking that I never observed capelan either in the stomach-contents of the cod or among the fish and debris on deck, although this is the favourite food of the cod in Finmark waters and also off Hope Island (Iversen, 1924). Sund (1927) reports that in the stomachs of cod from the "White Sea" (Capes Kanin and Chernyi) in December 1926, "the crab *Hyas araneus* was the largest item next to small fish..... Several kinds of shells were also present in the stomachs, notably *Cardium grœnlandicum* and *Astarte borealis*".

(d) Bottom Fauna.

Bottom living animals were collected from among the debris brought in with the catch. Relatively little was found in the "cod-end" with the fish, except in the early hauls, but a greater variety was obtained amidships under the starboard rail, where animals that had become entangled in the meshes fell out as the "belly" of the net was hauled inboard.

List of Bottom Fauna from Bear Island, July 1930.

A = Arctic distribution; B = Boreal distribution; W = Wide distribution covering both the foregoing regions, or distribution in regions influenced by both arctic and boreal conditions; U = ("Universal") Cosmopolitan distribution in a still wider range of conditions, including occurrences in the Mediterranean, South Atlantic, or other southern waters. Doubtful identifications are indicated by ?

Group and Species	Taken at Stations	Geographical Distribution
PORIFERA.		
Grantia nitida (Arnesen)	14	B
Tetilla cranium (Müller)	4	B
Gelliodes plexa Lundbeck	4	A to W
Chalina oculata (Pallas)	21	B
Mycale lingua (Bowerbank)	14	W
Myxilla incrustans (Johnston)	14	U
Iophon piceus (Vosmaer)	14	W
Tedania suctoria Schmidt	14, A [1])	W to U

[1]) A and B represent collections made respectively on 25th and 28th July 1930 without reference to any particular station.

Group and Species	Taken at Stations	Geographical Distribution
Topsentia fibrosa (Fristedt)	1	W to U
Stylaxia sluiteri (Vosmaer)	1, 14	A
Polymastia robusta (Bowerbank)	4	U
Weberella bursa Vosmaer	4	B
Not identified	25	
COELENTERATA. (a) Hydroida.		
Tubularia regalis Boeck	28, 30, 35, B	A to W
Halecium muricatum (Ellis & Solander)	25, 28, 30, 34, 35, 36?	B to W
Halecium sp.	40	
Campanularia verticillata (Linnaeus)	28, 30	W
Obelia longissima (Pallas)	30	B
Gonothyraea hyalina Hincks	28, 35	B
Gonothyraea Lovéni (Allman)	27?, 36	B
Lafoëa fruticosa (Sars)	21, 28, 30, 36, A, B	W
Lafoëa gracillima (Alder)	27, 28	W
?Lafoëa pygmaea Hincks	34, 40	B
Grammaria { ? abietina (Sars) / ? sp. nov. }	30	(W)
Reticularia (Filellum) serpens (Hassall)	30	W
Abietinaria abietina (Linnaeus)	30	U
Symplectoscyphus tricuspidata (Alder)	B	W
Diphasia fallax (Johnston)	25	B
Thuiaria lonchitis (Ellis & Solander)	28, 34, 35, A	A to W
Thuiaria carica (?) Levinsen	27	A
Hydrallmania falcata (Linnaeus)	14, 28, 30, 36, 39, 40	U to B
(b) Actinozoa.		
Drifa glomerata (Verrill)	21, 36, A	W
Gersemia sp.	2, 14, 40	
Hormathia margaritae Gosse	14, 24, 25	B
Chondractinia tuberculosa (Verrill)	1, 2, 14, A	B
Actiniaria? gen. et sp. indet.	A	
Epizoanthus ? incrustatus (Düben and Koren)	35	B
Epizoanthus sp.	36	
TREMATODA.		
Entobdella hippoglossi (Müller)	4, 10	W
NEMERTINEA.		
Amphiporus sp. (possibly A. bicolor Bürger)	1, 30, 35	
Lineus (?longissimus (Gunnerus))	14, 40	B
ANNELIDA. (a) Polychaeta.		
Eunoë nodosa Sars	21, 30, 31	W
Lagisca extenuata (Grube)	30	U
Nephthys longosetosa Oersted	27	B
Glycera capitata Oersted	28	U
Thelepus circinnatus (Fabricius)	28	U
Flabelligera affinis Sars	1	W

Group and Species	Taken at Stations	Geographical Distribution
Serpulidae, gen. et sp. indet.	14	
Not identified[1])	24	
(b) Gephyrea.		
Phascolosoma margaritaceum (Sars)	14, 28, 30, A	U
?Sipunculid — not identified	40	
CRUSTACEA. (a) Copepoda (Parasitic).		
Caligus curtus Müller	9	B
Lepeophtheirus hippoglossi (Kröyer)	10	W
Lernaeopoda elongata (Grant)	18	A to W
(b) Cirripedia.		
Balanus balanus (Linnaeus) da Costa	24?, 36, 40	W
(c) Isopoda.		
Æga psora (Linnaeus)	1, 36, 39, 41	W
(d) Amphipoda.		
Ischyrocerus megalops Sars	28	B
Ischyrocerus megacheir (Boeck)	A	W
Neopleustes pulchellus (Kröyer)	28, B	B
Pleustes panoplus (Kröyer)	30, 40	A (to W)
Pleustes medius (Goës) ♀ immat.	28	A
Photis Reinhardi Kröyer	21, 28, 30, 36	W
Metopa spectabilis Sars	B	W
Ægina spinifera (Bell)	27, 28, 30, 35, 36	A (to W)
(e) Macrura.		
Spirontocaris spinus (Sowerby)	28	A to W
Sabinea sarsii Smith	28	B to W
Sclerocrangon boreas (Phipps)	1	A
(f) Anomura.		
Eupagurus pubescens (Kröyer)	28, 31, B	W
(g) Brachyura.		
Hyas araneus (Linnaeus)	1, 28	W
PANTOPODA.		
Nymphon hirtipes Bell	27, 36, B	A
Colossendeis proboscidea (Sabine)	13, 35	A
ECHINODERMATA. (a) Asteroidea.		
Hippasteria phrygiana (Parelius)	2	W
Solaster papposus (Linnaeus)	1, 14, 40	W

[1]) Worms (crushed dorso-ventrally) found beneath pedal disc of *Hormathia margaritae* growing on shell of *Chrysodomus despectus*.

Group and Species	Taken at Stations	Geographical Distribution
Solaster endeca (Linnaeus)	14	W
Pteraster obscurus (Perrier)	14	A
Pteraster militaris (Müller)	1, 14	W
Henricia sanguinolenta (Müller)	1, 9, 14?[1]), 21, 27	U
Leptasterias mülleri (Sars)	14	W
(b) Ophiuroidea.		
Ophiura sarsi Lütken	40	W
Ophiopholis aculeata (Linnaeus)	1, 14, 28, 31, 35	W
Ophiopus arcticus Ljungman	30	W
Ophiacantha bidentata (Retzius)	14	U
Gorgonocephalus caput-medusae (Linnaeus)	14, 36	B
Gorgonocephalus eucnemis (Müller & Troschel)	21, 25, A	W
(c) Echinoidea.		
Strongylocentrotus droebachiensis (Müller)	1	W
Strongylocentrotus sp.	14	
Not identified	B	
(d) Holothuroidea.		
Cucumaria frondosa (Gunnerus)	1	W
(e) Crinoidea.		
Heliometra glacialis (Leach)	33	A
POLYZOA. (a) Ectoprocta.		
Menipea gracilis (van Beneden)	30	W
Caberea Ellisii (Fleming)	14?, 30	W
Dendrobeania Murrayana (Johnston)	31	W
Callopora spathulifera (Smitt)	36	A to W
Callopora lineata (Linnaeus)	36	U
Myriozoum coarctatum (Sars)	(1), B	A
Cribrilina annulata var. Spitsbergensis Norman	36	A to W
Porella compressa (Sowerby)	1?, 14	A to W
Porella glaciata Waters	14, 25, 27	A
?Porella concinna (Busk)	1	U
Discopora sarsii (Smitt)	(1), 36	A to W
Smittina bella (Busk)	31	B
Smittina reticulato-punctata (Hincks)	36	A to W
Cellepora nodulosa Lorenz	25, 27, 30	A
Stomatopora diastoporides Norman	34	A to W
Alcyonidium gelatinosum (Linnaeus)	14, 21	U
(b) Entoprocta.		
Loxosoma brumpti Nilus	14	A
Loxosomella antedonis Mortensen	36	A

[1]) Possibly a subspecies af *H. longispina.*

Groups and Species	Taken at Stations	Geographical Distribution
BRACHIOPODA.		
Rhynconella psittacea (Gmelin)	14, 27, 28, 34, 36	W to A
Rhynconella psittacea juv.	31	
MOLLUSCA. (a) Lamellibranchiata.		
Modiolaria corrugata (Stimpson)	35	A to W
Pecten islandicus Müller	1, 14, 30, 40, (B)	A to W
Pecten (Palliolum) groenlandicus Sowerby	40	W to U
Astarte crebricostata Forbes	39	A to W
Astarte elliptica (Brown)	35	W
Saxicava arctica (Linnaeus)	1, 14, 31	U
(b) Gastropoda.		
Lepidopleurus cinereus (Linnaeus)	30	W (to U)
Epitonium groenlandicum (Gould)	28	W
Epitonium sp. (probably E. groenlandicum)	40	
Trophon clathratus (Linnaeus)	28	W
Chrysodomus despectus (Linnaeus)	14, 24, 25, 31	A to W
Bela turricula (Montagu)	B	W
Natica (Lunatia) affinis (Gmelin) (juv.)	B	U to W
Admete viridula (Fabricus)	B	A to W
Dendronotus arborescens (Müller)	40	W
Dendronotus velifer Sars	27, 28	B to W
Dendronotus sp. (? D. velifer)	14, 30, 39, B	
Æolis sp.	40	
Coryphella salmonacea (Couthouy)	28, B?	A to W
(c) Cephalopoda.		
Rossia glaucopis Lovén ♀	40	W (and Patagonia)
TUNICATA.		
Kükenthalia borealis (Gottschaldt)	14	A
PISCES. (a) Elasmobranchii.		
Raia radiata Donovan	38	W
(b) Teleostomi.		
Gadus callarias Linnaeus	27	W
Hippoglossoides platessoides (Fabricius)	27	W (to B)
Sebastes marinus (Linnaeus)	2	W
Triglops pingelii Reinhardt	1	A to W
Anarrhichas minor Olafsen	14	A to W
Fish jaw fragment — possibly Cyclopterus lumpus	39	

The species taken in this manner are recorded in the fauna-list together with the station at which each was found and its approximate geographical distribution.

The number of stations at which any species was found is a rough indication of its abundance. Perhaps the most prominent group from the point of view of quantity was the Coelenterata, and the Polyzoa were also very plentiful if less conspicuous on

account of their small bulk. Crustaceans and Echinoderms, particularly Asteroids and Ophiuroids, were well represented. Annelids were not very numerous and Tunicates were almost absent. Sponges occurred in great quantity in the "cod-end" of the trawl during the first few hauls when there was but little fish; many of them were large specimens, too large to preserve, and they gave out a distinctive smell resembling garlic. Unfortunately I missed the opportunity of making a larger collection of them in the ill-founded expectation that they would reappear throughout the trip.

My experience coincides with that of Hartlaub (1900), who, in discussing the fauna to the west of Bear Island remarks ".... in zoologischer Hinsicht fand ich eine wesentlich andere Tierwelt als bei Spitzbergen. Bryozoën, Hydroiden, Spongien und enorme Pantopoden (*Colossendeis proboscidea*) waren für diese Gegend charakteristisch".

It will be seen that in the fauna-list the species are classified in arbitrary distribution-groups which indicate whether they are restricted to a purely arctic or purely boreal habitat, or whether they tolerate, to a greater or to a less extent, both types of environmental conditions in their geographical range. The symbols for the geographical distribution are explained in a key at the head of the list, and the classification according to habitat is based on the information available in the various publications which I consulted on the taxonomy of the different groups.

The total number of species in each distribution group is given below:—

Distribution-Group	No. of Species	
A	14	36
A to W	21	
W to A	1	
W	43	
W to B	1	23
B to W	3	
B	19	
W to U	4	19
U to W	1	
U	11	
U to B	3	

If all species with a tendency to Arctic distribution be added together (A, A to W, W to A), and similarly all those with a predominantly boreal range (B, B to W, W to B), we find that the arctic forms outweigh the boreal, but that forms inhabitating both regions and intermediate areas (W) outnumber either. There are also a certain number of species which range yet further afield into definitely warm waters and may be considered to display a very catholic preference and to have a more or less cosmopolitan distribution (W to U, U to W, U, U to B).

It is not surprising that the Bear Island fauna has such a composition for the island is situated in a high latitude and is surrounded by ice in winter and spring, yet, because it lies close to the western boundary of the Barents Sea, it comes strongly under the influence of water of Atlantic origin particularly during the summer and autumn. It may therefore be expected that those species will predominate which are found to

live equally well under either set of conditions. The population seems, in fact, to be typical of a border habitat.

I am deeply indebted to Dr. W. T. Calman and the staff of the Natural History Museum (South Kensington) for confirming or correcting my own identification of the various species. Dr. H. A. Baylis and Mr. M. Burton were kind enough to identify the Nemertines and Sponges respectively — groups which I was unable to identify satisfactorily. I tender my best thanks to Dr. I. Gordon and Miss A. B. Hastings, to Messrs. G. C. Robson, C. C. A. Munro, J. R. Norman, G. A. Smith, J. R. le B. Tomlin and Capt. A. K. Totton for the invaluable help that they gave me with different groups.

Notes on species showing points of particular interest.

Diphasia fallax was found to carry both male and female gonothecae on the same shoot, whereas Capt. Totton tells me that in this genus the sexes are usually separate.

Pteraster obscurus, represented by a single specimen, contained well developed young in the brood cavity. Mr. G. A. Smith pointed this fact out to me and also remarked that the young were on the point of emerging, which would fix the reproductive period as July—August in this region. This agrees well with the dates for the stations from which Döderlein (1900) describes this species and its young.

Hippasteria phrygiana were frequently present in the trawl, but were of such enormous size that I could only preserve the very smallest specimen.

Pleustes medius (Goës), taken at Station 28, was kindly identified by Professor Schellenberg at the request of Dr. Gordon, who tells me that it seems to be a very rare arctic species and was apparently last recorded in 1876. The specimen is an immature female.

Mr. C. Elton, who visited Walrus Bay, Bear Island, with the Oxford Spitzbergen Expedition on 22nd June 1921, has sent me two crabs and three holothurians which he found cast ashore there after a heavy gale. The crabs, which are much larger than any of my specimens, are *Hyas araneus* and the holothurians are *Cucumaria frondosa*.

Bottom fauna in fish stomachs.

The following lists give the bottom-living animals (and nekton) found in the stomachs of haddock and spotted catfish.

Station 10. Spotted Catfish.

Solaster papposus (6 individuals)
Ophiura sarsi (12 individuals)
Ophiopholis aculeata (1 or 2 individuals)
Echinoid remains
? Ophiuroid remains
Pecten islandicus (remains)

Station 15. Haddock.

Nermertine (large)
Phyllodoce sp. (? *P. groenlandica*)
Euthemisto compressa (Goës) (1 individual)
Parathemisto abyssorum (a few)
Thysanöessa inermis (numerous)
Ophiuroid
? *Pecten* sp. (1 young individual)

Of the true benthos only the *Phyllodoce* (? *P. groenlandica* Oersted; distribution

A to W) is not represented in the bottom fauna. *Thysanöessa inermis* (distribution A to W), which occurs in all the cod and haddock stomachs, is not a truly benthic form, while *Parathemisto abyssorum* (distribution W) and *Euthemisto compressa* (distribution A to W) also belong more properly to the nekton or to the plankton than to the benthos. Of these two species of Amphipods, the former, which are probably young individuals, are fairly common in cod and haddock stomachs, but only a single specimen of the latter was found.

(e) Plankton Samples.

Three vertical hauls were made with a tow-net of $^1/_2$ metre mouth-diameter, which was attached to 50 fathoms of line. The silk of the bag had 40 meshes to the inch, as had also the silk disc of the terminal bucket, below which a lead sinker was suspended.

Of the three hauls only the last was truly vertical, in the two former the haul was oblique owing to the drift of the ship to leeward. The first haul was made by hand but the steam winch was used for subsequent hauls.

Mr. A. C. Gardiner had the kindness to examine these three plankton samples. In his opinion they were practically monotypic being composed almost entirely of copepods, which were apparently *Calanus finmarchicus* although very large females, almost as large as *C. hyperboreus*, were present. The samples were "characterized by extreme paucity of adults, especially males". The number of *Calanus* present was not great in any of the three samples, in fact the plankton appeared to be poor both in species and in individuals.

Apart from the copepods, I examined and identified the following species from the plankton samples. (Capt. Totton kindly identified *Aglaura* and confirmed my identification of *Diphyes arctica*.)

Plankton Sample 1 (after Station 11). Date: 22.7.30. Time: 1915 G.M.T.

Species	Distribution
Chaetognath (1 individual)	
Parathemisto abyssorum Boeck	W
Megalopa of *Hyas* sp.[1])	
Limacina helicina (Phipps)	A to W

Plankton Sample 2 (after Station 17). Date: 23.7.30. Time: 2030 G.M.T.

Species	Distribution
Parathemisto abyssorum Boeck	W
Thysanöessa inermis (Kröyer) (1 small individual)	A to W
Larval Decapods: Zoea (probably *Hyas araneus*)	
Larval Decapods: Megalopa (*Hyas* sp., probably *H. araneus*)	
Larval Decapods: Moulting stages between Zoea and Megalopa (probably *Hyas araneus*)	

Plankton Sample 3 (after Station 25). Date: 25.7.30. Time: 1610 G.M.T.

Species	Distribution
Aglaura sp. (? *A. hemistoma* Péron and Lesueur) (3 or 4 individuals)	U (not A)
Diphyes arctica Chun (1 specimen)	W to A
Chaetognaths (5 individuals)	

[1]) possibly from Sample 3.

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As I was unable to satisfy myself that the Chaetognaths belonged to the genus *Eukrohnia* I sent them to the Discovery Investigators who had the kindness to examine them. They include two individuals of *Eukrohnia fowleri* Ritter-Zàhony (distribution U to B) and possibly two individuals of *Sagitta* sp.; the remaining specimens could not be identified satisfactorily.

It is interesting to find *Parathemisto abyssorum* present in the first two plankton samples, both of which had a greatest depth of less than 50 fathoms owing to the obliquity of the hauls. This species, which occurs in cod and haddock stomachs, is therefore also found well above the bottom. *Thysanöessa inermis* is only represented by a single individual in one plankton sample (Sample 2). If this species is present at all it must be confined to the lower water layers, at any rate in the later hours of the day, for the soundings at adjacent trawl stations (Stations 11, 17 and 25) were between 72 and 82 fathoms. In Sample 3 where the maximum depth attained by the tow-net was about 50 fathoms *T. inermis*, if present, must have been within 20 or 30 fathoms of the bottom. Hickling (1925) finds that *Thysanöessa* sp. (probably *T. inermis*) show a diurnal migration in the area off the mouth of the Bristol Channel, being numerous near the bottom at midnight and 10 a.m. and scarcer at about 4 a.m. and 5 p.m., although, unlike *Nyctiphanes Couchi* and *Meganyctiphanes norvegica*, they seem to be present near the sea-floor in considerable numbers at all hours. Although the distribution of *T. inermis* may have been discontinuous and patchy, I retain the impression that the cod always contained a certain amount of krill, though at some times in far greater quantity than at others. I therefore think it likely that *T. inermis* occurred practically everywhere, possibly in great concentrations in certain positions, and that the negative results of the plankton hauls do not necessarily imply complete absence of this species at greater depths, beyond the reach of the tow-net, which had a maximum depth when fishing vertically of only 50 fathoms.

Since the cod were consistently feeding on krill throughout the voyage a comparison of the results of trawl-hauls made at about the same time as the plankton-hauls may be of interest.

The trawl-hauls adjacent to Plankton Samples 1 and 3 (i.e. Stations 11 and 12, 25 and 26) produced very small quantities of cod, but that previous to Sample 2 (Station 17) provided one of the largest catches we made. This large haul was followed by a good catch of 50 to 60 baskets in twenty minutes' towing (cf. Station List; footnote C), but at Station 18 the results were poor although the cod were seen still to be feeding on krill.

Thus cod were plentiful near the time when I obtained the only plankton sample that gave positive evidence of the presence of *Thysanöessa inermis*. Naturally on such slender evidence I do not wish to maintain that the abundance of cod depends on that of krill, but it is perhaps allowable to suggest that the localized concentrations of cod, which were manifested in the variations in the catch, were very possibly connected with a somewhat similar distribution of the krill on which they were feeding. Thus Hickling (1927) shows that in certain cases a simple and direct relation exists between the catch of hake, to the west and south-west of Ireland, and the mean weight of krill (*Meganyctiphanes norvegica*) present in the stomachs of the blue whiting and small hake on

which the larger hake feed. He supposes that concentrations of hake of marketable size arise in areas where small hake and blue whiting have congregated in numbers owing to local abundance of krill.

Zusammenfassung.

Die vorstehenden Zeilen geben einen Überblick über eine Reise mit dem Fischdampfer St. Rose aus Hull nach der Bären Insel im Juli 1930. Auf der Reise wurde 7 Tage mit dem Schleppnetz gefischt und der Verfasser konnte folgendes Material sammeln:

Längenmessungen an Kabeljau (2189 Fische) und Schuppen (ca. 400 Fische).
Mageninhalt von Kabeljau, Schellfisch und geflecktem Seewolf.
Gonaden von Kabeljau.
Proben der Bodenfauna aus dem Schleppnetz konserviert.
Drei Planktonproben.
Beobachtungen über die Oberflächentemperatur nach jedem Hol und einige Beobachtungen über die Bodentemperatur.

In der Nähe der Bären Insel wurden auf der Ausreise eine Serie von 10 Wasserproben und Temperaturbestimmungen von der Oberfläche gesammelt, auf der Rückreise 3 Proben. Bei jedem Schleppnetzzuge wurden Tiefe und andere wichtige Einzelheiten sorgfältig notiert, auch konnte der Verfasser einige Photos machen.

Die Entwicklung der Britischen Schleppnetzfischerei bei der Bären Insel wird besprochen und ein kurzer Überblick über die geographischen und hydrographischen Verhältnisse dieses Gebietes gegeben.

Die hydrologischen und biologischen Beobachtungen, welche auf der Fahrt gemacht wurden, werden besprochen. Als interessantestes Ergebnis zeigt das biologische Material die enge Übereinstimmung der Längenverteilung der Kabeljau von der Bären Insel und von Finmarken. Die Kabeljaus von der Bären Insel nährten sich jedoch fast ausschliesslich von Krill (*Thysanöessa inermis*), während die Kabeljaus von Finmarken hauptsächlich Capelan fressen, was auch durch dessen norwegischen Namen (loddetorsk) angedeutet wird.

Die bei jedem Hol gefangene Fischmenge ist, zusammen mit anderen Einzelheiten, in einer Fang-Liste angegeben.

Die Bodenfauna zeigt eine Mischung von rein arktischen und borealen Arten, was wahrscheinlich typisch ist für eine hydrologische Grenzregion, wie sie die Bären Insel Gründe darstellen.

Das Fehlen von Krill in den Planktonproben wird im Zusammenhang mit der Wichtigkeit dieser Krustaceen als Hauptnahrung des Kabeljau erörtert.

I am greatly indebted to Dr. H. Lissner (Hamburg) for translating the summary into German and to Mr. C. F. Hickling for reading over the manuscript.

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APPENDIX 2.

The Barents Sea and the Bear Island.

By

Johannes Lundbeck, Wesermünde.

In the year under review a total of 36,308 fish from this area were measured, all measurements — with few exceptions — being made at the fish market. These measurements apply almost only to cod and haddock (in equal numbers). Of a smaller number the age also was determined.

The continuous investigations, started in the autumn of 1930 on German landings from this area, were continued until the end of the fishing period in May 1931. Through regular observations from a whole fishing period valuable data were procured regarding migration, age-distribution etc. of the cod- and haddock-stock fished.

These investigations at the fish-market were supplemented by others made on the spot on board a trawler (28th March to 21st April). Above all, the occurrence of the fish in the Barents Sea could be ascertained here at about the time when the return migration to the west had been completed: in quantities worth catching, haddock were found in the west to 33° E. only, and cod to 36° E.; both species were completely lacking east of 38° E.

After the completion of these investigations a survey of the fishing conditions and specially of the habits of cod and haddock in the Barents Sea was made on the basis of the whole of the material collected up to the present; this has been published at the end of January this year in the "Wiss. Meeresunters. Abt. Helgoland, Vol. XVIII, Nr. 8".

Further investigations on a reduced scale, were taken up in November only, with the special aim to find statistical data permitting a comparison with the two preceding years:

The number of voyages to the Bear Island was, especially at the end of the year, remarkably greater in 1931 than in 1930. Into the Barents Sea proper, however, fewer voyages were made in 1931, in conformity with the general reduction of the fishery.

The market measurements give the following averages:

Average catch per voyage in November—December, 1931 (numbers).

Length cms.	Cod		Haddock	
	Canin	Bear Island	Canin	Bear Island
31— 35	..	..	62	4
36— 40	..	..	380	11
41— 45	2	..	1,255	63
46— 50	22	620	1,647	93
51— 55	125	3,442	2,547	244
56— 60	255	4,769	2,639	292
61— 65	274	3,844	4,832	387
66— 70	282	2,545	7,077	1,589
71— 75	321	3,446	4,690	1,617
76— 80	439	4,232	2,275	489
81— 85	640	4,862	817	130
86— 90	808	3,615	106	16
91— 95	662	1,469	17	..
96—100	280	586	..	..
101—110	83	566	..	..
111—120	1	79	..	..
121—150	..	17	..	..
Total	4,194	34,092	28,344	4,935
(Total, 1930	6,038	16,547	15,200	12,889)
Weight in kgs.	16,857	73,142	60,644	14,928
(Weight, 1930	22,946	41,106	43,439	23,350)

In the autumn of 1931, as compared with the same season of 1930, the yields of the Cod fishery were decidedly better at Bear Island, but much poorer in the eastern Barents Sea.

At Canin, the lengths of about 80 to 85 cms. which used to form the bulk of the catches from this area, were very sparse. Individuals of 90 cms. and upwards alone had not decreased compared with recent years, and so they now constituted the essential part of the catches. Besides, small cod of about 60 cms. in length occurred in relatively great numbers.

In the area of the Bear Island the lengths of about 80 to 85 cms., and further those of about 55 cms. were very numerous, whereas the intermediate lengths of about 70 cms. were much rarer. — In 1930, the bulk of the cod had here a length of about 70 to 75 cms. only, so the occurrence of the bigger fishes was not to be expected. But since they are precisely the same sizes which suddenly occur here while they are strangely absent from Canin it is evident that they are the same shoals which, according to the experiences of former years, should have been expected at Canin. The reason why they have migrated to Spitzbergen this year remains a mystery, but in case the presumed migration proves to be true there seems to be a way here for understanding the well known fluctuations in the results of the catches at Bear Island.

The Haddock-catches and their composition did not differ materially from those of the last year; at Canin they were larger, at the Bear Island smaller but more regular in 1931 than in 1930.

Raja spinicauda Jensen was observed as a new species for this area in the landings from the Bear Island and isolated in the landings from the Barents Sea.

Further research work will comprehend:— 1) As in the last three years, the regular observation of the catches through market measurements. 2) the study of the problems emanating from the work so far done, especially the scale-investigations for testing the method of age-determination and for determining the growth fluctuations. 3) for 1932, investigations during a trawler-voyage to the Bear Island are planned.

APPENDIX 3

Chief Results of the Fishery Research in the Barents Sea in 1930 by the GOIN (State Oceanographical Institute of U.S.S.R.).

Ref.

E. Messiatzeva, Moscow.

A meeting of the Board of the State Oceanographic Institute (GOIN) was held in Moscow on the 14th to the 22nd April, 1931.

This session summed up the results of the year's work of the Institute in the Barents Sea.

In this article I will try to give a general outline of the most important questions discussed at the meeting.

Reports were read at the conference by the following study-groups and sections: by the race, age, ichthyoplankton, food, oecology, stock (estimation), and expedition-planning study groups, and by the hydrologic, ocean-rainfall, and hydrochemical sections.

I. Messiatzeff, Director of the Institute, made a general report summing up the work done in the open sea, and a report of the investigations of coastal fisheries.

I. The Race Study Group.

This group investigated about 12,000 cod from the main fishing banks of the Barents Sea.

For race analyses both countings (the number of vertebrae, fin-rays, gill filaments) and measurements (mainly the size ratio of different parts of the skull) were used.

It was found that the Barents Sea cod was not racially uniform. Up to the present the Barents Sea cod was considered to be racially uniform. This conviction may be partly due to the fact that the material used for race analyses was not very extensive. For the Barents Sea the study group has established about ten races which they, at present, name "differentia".

Biometric analyses proved that peculiar "differentia" belong to the separate banks. Specially prominant, morphologically, are the fiord "differentia" (Motovsk fiord), the Bear Island, Murmansk, and Goose Bank "differentia". A comparison of the fiord fish with those of the open parts of the sea, has shown that the fiord fish have a smaller number of vertebrae, fin-rays and gill filaments. These data correspond well with the results obtained by Schmidt who studied the North Atlantic cod.

Sex dimorphism is absent in the Barents cod. The question of genetic interrelations of races remains, as yet, open.

II. The Age Study Group.

Some 20,000 cods were investigated by this group. Their age was determined by scale and otoliths.

The age-determinations made by the group coincide well with foreign data (Oscar Sund, Dannevig, Damas), but differ considerably from the age-estimation given by Michin.

From the age-analyses of the shoals it was evident that age-grouping was not the same for the different banks, and that on one and the same bank it may vary with the seasons. Thus at the end of April, and in May 7 years old cod prevailed on the Ribatshy Bank, while on the Murmansk Elevation and the Finmark Bank, during the same season 10 and 11 years old cod were predominant. Along the north-western slope of the Bear Island Bank the ages prevailing were 8 and 9 years in July, and 5 years in January.

As to the quantitative proportion of sex, male and female fish are represented almost equally in the majority of shoals.

Separate shoals (differentia) differ one from another in rate of growth, and in the average size and weight.

Let me give some examples of average length and weight in the 8 years old cod:

	District	Length (cm.)	Weight (g.)
28/V 1930	Ribatshy bank.....	67.2 ± 0.3	2,208 ± 34
21/IV 1930	Bear Island bank	68.34 ± 0.40	2,361 ± 48
14/VI 1930	Murmansk bank.....	71.80 ± 0.54	2,467 ± 67

So far calculation of growth from scale zones has not been made. The rate of growth is given in the percentage of increase in average length and weight, as compared with the preceding year.

In the case of the younger (earlier) ages the increase in length and weight goes on intensively, but later shows a gradual tendency to cease.

The results obtained from the analysis of the ratio between the weight of the fish to he cube of length are very interesting. This ratio which, to a certain extent, expresses the density of fish substance, hardly changes with age, and characterizes the separate shoals very well.

III. The Group investigating Ichthyoplankton.

Of the very interesting results arrived at by the group investigating ichthyoplankton, the following may be pointed out:

a) the existence of spawning areas of the cod along the Murman coast from the Motovsk fiord to the Gavriloff and Bear Island coast. (This fully agrees with the findings of the race-study group, regarding the existence of Fiord and Bear Island races).
b) the existence of haddock spawning in the Motovsk fiord, and
c) capelin spawning near the Ribatshy peninsula, at the mouth of the Motovsk bay, near Kildin, and above the Teriberka.

The spawning grounds of the haddock have been unknown up to the present, not only in the Murman but along the shores of north and middle Norway as well.

The finding of the capelin spawning grounds is important because the cod comes for the capelin to the shores and can be caught in these parts in great quantities during the spawning period of the capelin.

The cod spawning season in the Murman Area is February—April, the haddock spawns in June, and the capelin in West Murman in March—April, in Middle Murman in June—July, and at Novaya Zemlya in August—September. In April 1931 the research vessel of the GOIN sailed for Motovsk fiord, and caught 760 kilograms of spawning cod in 5 hauls of the trawl.

This fully confirmed the conclusions arrived at by the group studying ichthyoplankton as to the existence on the Murman of spawning cod.

Up to the present the spawning of the cod, haddock and capelin had not been traced as to regions or seasons, and only stray indications existed as to the possibility or existence of spawning.

IV. The Nutrition-study Group.

The work of this group was carried on along the lines of a general analysis of the food consumed by the chief objects of the fishing: the cod, haddock and the Norway haddock (*Sebastes*).

Somewhere about 6,000 cod stomachs were investigated and about 4,000 stomachs

of other kind of fish. The nutrition of every fish was determined both for quality and quantity.

A biological analysis of the contents of the stomach and intestines showed the selectiveness of nutrition, and made possible the drafting of a food spectrum for each separate kind of fish according to different fisheries.

The cod feeds chiefly on fish, plankton, and organisms of the bottom as well. The haddock's taste is that of a typically benthal fish and its favourite food is *Ophiura*.

The predilections of the *Sebastes* are similar to those of the cod.

When working out the material the group applied indexes, i.e. the ratio of stomach and intestine contents to the weight of the body.

One of the chief conclusions arrived at is that the cod feeds, mainly, outside the banks.

The opinion that the fishing banks are the best pastures, has proved wrong. At the time when the cod gathers in great numbers on the banks, during the fishing seasons, it does not feed, however, or perhaps it will be more correct to say that it feeds to a very small extent. The chief feeding-time is when the fish is scattered.

V. The Oecology Group,

established a tropism of the fish in regard of temperature and depth, the depth-tropism being especially marked. The influence of other factors is more complex, and here nothing is clear. In most parts the fish keep to the slopes of the banks, and are found in greater numbers at a depth of 150 to 200 metres.

Greater or less preference of one or other depth may change, depending on the region and season of the year.

Along the south and east slopes of the Bear Island bank the fish keep to depths of about 150—200 metres in the Winter and Summer months while in August the main stock gathers in depths of 200—275 metres.

There are definite bathymetric and thermic limits of habitat of the cod, the haddock, and the *Sebastes*. The cod in most parts keeps to depths of 150—200 metres.

As regards temperature, the cod is notable for considerably greater endurance, and is, in comparison to the haddock and *Sebastes*, more eurythermic.

The distribution of the cod reaches to the east, as far as the Kara straits, and to the north almost as far as the northern extremity of Spitzbergen. It is met with in temperatures of $+5$ to $-1.40°$. The most favoured (suitable) temperature is $+1°$ to $+2°$.

The *Sebastes* is found in greater depths than the cod. It is a stenobathic form, and is scarcely ever to be found in depths less than 150 metres.

In the western parts of the Barents Sea the haddock and *Sebastes* are more fond of warmth, and their habitat both to north and east is more limited. The most favoured conditions of the haddock are between 2 and 3°. *Sebastes* favours warmth most of all, and keeps to the warmer waters.

VI. The Group of Stock Estimation.

This group used the statistical material of the Northern State Fishery Trust (Sevgossribtrust) for a 5-year period (1926—1930), and the fisheries' data of 1930 obtained from the ships of the GOIN.

The investigations concerned the cod, haddock and *Sebastes* which make up about 95—97 % of all the catch of the trawler fleet.

Trawl-fishing in the Barents Sea is done mainly on the banks of the southern part of the Sea at 72 lat., and latterly, at the urgent request of the Institute, it has also been done on the Bear Island' bank. Outside the banks the fish is scattered, and fishing is not profitable. The yearly average catch is about 1 ton per trawl hour, and for non-fishing regions it is below 0.2 tons.

Every bank is fished at a fixed season; at other seasons there is probably no fish there. The work of trawl-fishing is done as follows, during the year: in spring fishing is concentrated on the western banks, and moves to the east, returning again in Dec.—Jan. to the West. The biggest catches for the Barents Sea fall in the months of May and January; the smallest catches are made in October and March.

Every bank has its characteristic species and age assortment. On the western banks we meet an equal quantity of cod and haddock, and mixed with these are from 20—25 % *Sebastes*.

In the Gulfstream the cod prevails to a considerable degree. On the Goose bank only cod can be caught; in the Kanin—Kolguef area on the contrary, it is haddock that abounds.

Similarly the age-composition also differs according to the area. Thus, on the Western banks medium cod predominate, on the Goose bank large cod. The total stocks are estimated at $1^1/_2$ million tons for the southern part of the Barents Sea, and 750,000 tons for the Bear Island bank.

These figures represent a minimum. The doubled figure of 3 million tons for the southern Barents Sea and 1,500,000 tons for the Bear Island bank would be more probable.

The estimation of the total stock was done by means of a graphic method, as being the quickest.

The whole map of the Barents Sea was divided into squares. For every square the average catch per trawl hour was calculated as weight of live fish. Knowing the area of the square, the quantity of fish caught, the number of squares and hauls, and the vertical density of a shoal, it was not difficult to calculate, by means of simple arithmetic, the total amount of fish for a given fishing region. Thus, it would be easy to calculate the stock for the whole of the Barents Sea. The chief difficulty lay in the fact that the vertical distribution of fish was unknown. Up till now, it was believed that the fish keep close to the bottom.

To verify these data the Institute carried out a number of tests. At definite levels of depth long lines were set, homogeneous in bait and outfit. The quantity of fish caught in the different levels was counted. The tests proved that the fish does not keep close to the bottom, as was formerly supposed, but that it is distributed through a considerable

depth of water. And the greatest density of the shoal is not near the very bottom but lies from 15 to 20 metres above.

The figures for the total stock, given by the group, are somewhat understated. In order to avoid exaggerations, the group intentionally started from data leading to smaller results. So, for example, the fish actually caught by the trawl was considered as 100 % of the fish present in the area swept by the gear, while in reality a considerable part of the fish escapes the trawl.

Then, when making the calculations, it was supposed that on the banks one and the same fish shoal was fished upon.

Biometric analyses showed, however, that the cod of the Barents Sea were not uniform as to race. Every bank has its own peculiar race, and migration from one bank to another does not take place. It should be taken into account that one and the same shoal is not caught on all banks but that fresh shoals keep coming, and that the trawl catches only a small part of the shoal. The figures for the total stock of fish in the Barents Sea should therefore be altered considerably, and should be given as a good deal higher.

Considering all this, the group estimates the total amount of fish for the southern regions of the Barents Sea at 5,000,000 tons.

VII. The Hydrological Section.

A. Hydrology proper. During trawling work, hydrological observations were carried out on the vessels of GOIN.

One thousand stations were taken for research purposes. Connection was established with the Gulfstream.

In regions directly subject to the influence of the Atlantic water very great stability in the hydrological regime is observed. Both temperature and salinity fluctuations are insignificant in these parts.

All the fishery banks in the Barents Sea are within the range of strong influence of the Gulfstream, while the non-fishing regions are subject to violent seasonal fluctuations. The material studied is published in the form of short articles concerning the different fishing regions.

B. The map-drawing section, has presented detailed depth charts of the Barents Sea, which have already been published by the Institute in collaboration with the Chief Hydrographic Department. Previous to publishing these charts, the captains of trawlers were furnished with blue-print charts for guidance during trawling operations.

An interesting feature was the dynamic map of the Barents Sea produced by the Section by means of Helland-Hansen's and Bjerknes' method.

The map, dealing with the distribution of currents, represents the dynamics of the waters of the Barents Sea in quite a different way. Hitherto, we have always used the Knipovitsh scheme. We are not, as yet, in the habit of applying fishery data to a dynamic chart. And the mere fact that the fishery regions are the most dynamic,

speaks for the importance of the charts as a guide to fishermen. The distribution of the spawn, young and adult fish is unquestionably connected with the currents.

In the year 1931 the Institute intends to make this chart more detailed, being the first dynamic map of the Barents Sea.

VIII. The Section of Ocean Deposits,

has furnished a description and map of the deposits of the Barents Sea fishing regions.

Up to the present there was no such map, and only the casual data of navigation charts were available.

The section made use of 62,000 indications by trawlers and research vessels of the Institute from the whole period of their work. For the fishing regions a detailed description of the grounds is published, the character of the bottom is described, and the numerous wrecks and rough places are indicated; mention is made of objects which impede fishing (stones, sponges, etc.).

It is interesting that all the rough places were found close to the 200 metre isobath. Studying the profiles it was seen that the ancient terrace, sunk under the water, is an especially rough place, where boulder material is concentrated.

At present the Institute is constructing a trawl, which will go in a given, fixed, depth. A construction of this kind will reduce the damaging of the trawl.

IX. The Section of Hydrochemistry

has made a chart of distribution and seasonal changes of various chemical elements of the Barents Sea. Special attention was given to the study of the regime on different fishing banks.

It has not yet been possible to co-ordinate fishery and hydrological data with the results of hydrochemical investigations.

X. The Expedition and Planning Group.

Extensive discovery work has been carried out by the Institute. During the year 1930 the vessels of the Institute undertook 55 expeditions to the Barents Sea.

100,000 fish were measured. 4,295 fish were marked; of these 2,874 were cod, 560 haddock, 739 long-rough dab, 38 cat-fish, a few plaice, skate and other fish.

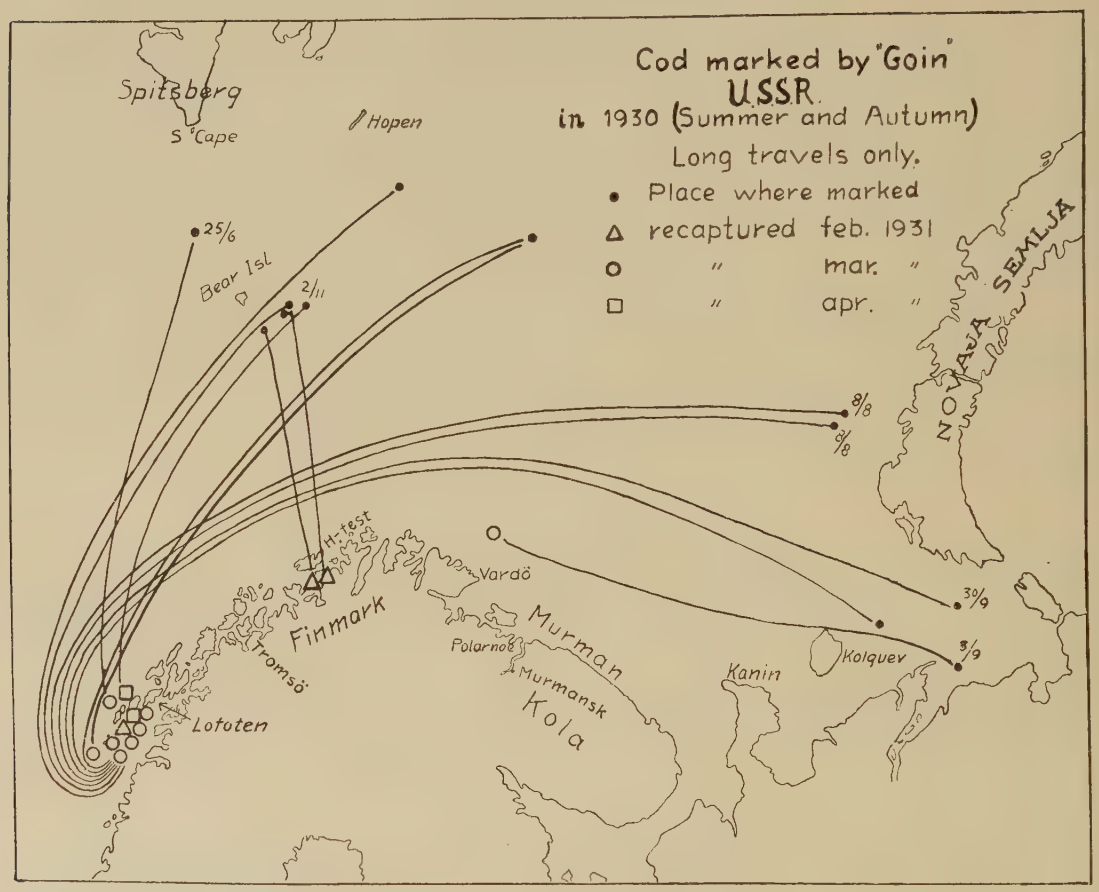
The marks used were quadrangular silver marks with the letters U.S.S.R. or R. ГОИ and number, engraved on them, fastened like a clip to the edge of the gill cover.

Marking was done in the different parts of the Barents Sea — on the Bear Island bank, and in the northern and southern regions of the Barents Sea. The percentage of fish recaptured is very small. Up till now 28 specimens have been recaptured: 22 cod, 5 haddock, 1 long-rough dab, and 1 skate.

Part of the marked fish were caught soon after being marked, and near the place

where they had been liberated. But, latterly (March—May), the Institute has received from Norway marks of fish caught at Lofoten and Finmarken. Some of the fish retained the marks for 10 months, and travelled to the Norwegian coast from Bear Island bank and from the S.W. and S.E. shallows of the Barents Sea.

The longest distance travelled by a marked fish (cod) equals 960 miles.



Above is a sketch map giving details of some of the recaptures.

At the end of 1931 an account will be given of the markings done and of the recaptures.

The Oceanographic Institute of U.S.S.R. requests that marks should be sent to the following address: Moscow, the Oceanographic Institute, Herzen Street, 6.

Short Account of the Investigations of the Coastal Fishery. (I. I. Messiatzev).

As a result of observations made by the Institute at the fishing villages ten-day charts were made of the handline fishing and seine fishing in 1929 and 1930.

They were made up from the telegraphic fishing reports, the control figures of the coastal research vessels and data supplied by the fishermen, rendered on special forms sent out by the Institute. These charts show the approach of the fish to the shore in three runs: the early spring run at the beginning of April in the Motovsk fiord (the Fiord race), and two runs at the end of April and the beginning of May. One shoal approaches the northern part of the Kola fiord, and the other appears in the Gavriloff region. The spring handline fishing goes on during the month of May.

Line fishing also commences almost simultaneously in the East and West.

Biological analysis of the fish-shoals according to assortment and age, confirms this view.

As to assortment, the Kola fiord abounds in haddock, and in the Teriberska region cod plays a somewhat bigger part, while in the Eastern regions cod is absolutely predominant.

These charts are the first as yet, and they are incomplete. One of the aims of the Institute was to determine whether codfishing in Murman was possible all the year round. This question has been answered by the Institute in the affirmative. In West Murman codfishing is possible all the year round, with a very small decrease of the line-catch in February and in January. Net-fishing too can give very considerable results in these months.

The estimate of the total amount of coastal fish gives no grounds whatever for apprehension.

The Institute has commenced the elaboration of a bathymetric fishing chart of the coastal area. In 1930 a chart of the Motovsk fiord was ready, and in 1931 a chart of the Teriberska and Gavrilovo areas will be completed. Coastal charts will be printed and introduced in the practice of collective fishing corporations. The work of the Institute has proved that even in the coastal regions the fish is attached to certain temperatures and depths, and that it keeps to special "leschiadi", as the pomors call the more or less sloping inclines or "zavals".

A number of experiments, with different kinds of bait, were made by the Institute (fresh, frozen, and salt herring, sand-eel, mussels, worms and artificial bait).

Very good results were obtained with fresh herring and sand-eel bait, and somewhat less satisfying results with frozen bait. The cod does not take well to salt herring and sand-eel, whereas haddock is readily caught.

Experiments on the length of time the lines stay, and the mode of setting them, furnished points of interest. The fishermen usually let the lines stay 6 hours, one tide period. Experiments showed that during the seasons when the fish is approaching (May to July), it is quite sufficient to keep the lines sunk from $1^1/_2$ to 2 hours. Keeping them longer does not increase the catch, on the contrary, diminishes it, as part of the fish get free of the hooks and part of them are eaten by preying fish etc.

During the autumn and winter months the best catches are obtained with lines, set for $1^1/_2$ to 3 hours.

The Institute recommends that fishing during the period of May to July, should be done by 2 vessels fishing together. One of the boats only throwing the lines, while

the other one, furnished with a line-capstan, follows and hauls them in. With this system much better results are obtainable. The boat throwing the lines may be of smaller size and need not have a capstan. At the present moment this is important because in the North we have not got a sufficient number of vessels furnished with capstans.

As regards the setting of lines, a number of experiments proved that the biggest catches are got when the lines are suspended about 15—20 metres above the bottom, and not when they are set close to it. The setting of suspended lines does not take more time, than setting in the usual way.

The Institute also carried out experiments in timing the setting and hauling of lines by hand and by means of capstan. Further work was done in determining the efficiency of small trawls, and experiments were carried out with herring drift-nets, etc.

There are no suitable places along the coast where small trawls can be used, neither have there been found any places with suitable ground and with considerable concentration of fish, except the wellknown fishing region in the Motovsky fiord "near the Bazaars" and in "the Motka".

Herring fishing by means of drift-nets shows very good results. Quite unexpectedly good results were obtained with treble-nets, both stationary and floating, when catching cod, even during the light season of the year. Till quite recently it was considered that net fishing could not give good results in the Murman.

Finally, extensive work was done by the Institute in connection with statistics and economy in the fishing industry.

The methodical aspect of this work is interesting:—

1) The main staff of correspondents having to do with filling in of forms and keeping records, consisted of workers in collective fishing corporations.
2) A selective examination of the vessels was done; and the daily output of the collective corporations and villages ("stanovishtshe") were recorded by means of filling in diurnal forms.
3) The material of the statistical-economic group was used by the planning organisation in the course of their work.

As regards the statistics and economy of coastal fishery, it should be mentioned that even by merely adding up the amount of fishing gear used, the principal facts on the fishing industry must appear, the number of sailings per season, the catch per unit of gear, per fisherman and per vessel; the number of fishermen per vessel, and the amount of gear per vessel. These figures are higher in 1930 than in 1929.

A Summary Report on the scientific Fishery Work done in Respect of the non-coastal Areas of the Barents Sea.

In his report I. I. Messiatzeff underlined the chief results obtained by the different study-groups and sections, and pointed out the great importance of these results.

Concluding he outlined a working hypothesis on the migration of the cod in the Barents Sea.

The principal region where the fish migrates from the Barents Sea with the approach of unfavourable conditions is considered by the reporter to be the North Cape elevation. In spring, part of the fish migrates from this place to the shores of Norway to spawn, but the greater part moves to the Barents Sea.

The cod comes in separate shoals, and tends to move towards strictly definite banks. The fish collect here when approaching from the West, and when leaving the East for the West. On arriving from the West the fish disperse in the space outside the banks in search of food. The fish scarcely ever feed on the banks.

No more than 10—15 % of the fish migrate annually to spawn. The cod does not spawn every year, but apparently only 2 or 3 times in the course of its whole existense. In warm years like 1930—31, the coming of the fish from West, and its passage eastward, does not occur at one time, there is no accumulation of the fish on the banks, and the catch per trawl hour decreases.

On the contrary, when the year is cold, the shoals of fish come all at one time; great concentration of fish may be observed on the banks, and the catch is higher.

The reporter concluded by stating that the total amount of fish in the Barents Sea cannot be technically exhausted even if a greater number of trawlers were available than that fixed by the five-yearplan, because every bank is fished by the trawler fleet only during a short period.

APPENDIX 4.

On the German and Norwegian Observations on the Cod in 1931.

By
Oscar Sund.

By the inception of extensive market measurements and other observations on the "Arcto-Norwegian" cod stock by the Germans in 1929 a very important step forward was made as to the means of evaluating the strength of this stock of cod. It is the more fortunate that the observations have been extended to include also those shoals which do not come within the reach of the coastal fisheries in Norway as the stock in later years has become more and more the object of an increasing trawl fishery extending over the whole area of its habitat. The German and Norwegian observations complement each other in the happiest way, the former supplying the interesting data about the shoals moving to and fro on their feeding grounds, the latter pertaining mostly to the shoals of segregated spawners which have from times immemorial supported the Norwegian winter fishery.

In fig. 1 I have tried to compare the length measurement curves for the four main fishing areas: the trawl grounds at Cape Kanin in the far Eastern portion of the Barents

Sea, the trawl area around Bear Island on the western edge of the Barents plateau, (both these from the German data given in Dr. LUNDBECK's account [appendix 1]), the coastal line fishing along the Finmark coast in the spring and lastly, the spawning areas along the Norwegian coast between latitudes 60 and 70, the "Skrei Coast" as it might be termed from a fishery view point. The two lower (Norwegian) curves are drawn from data for each cm. group, the two upper for 5 cm. groups which may serve for a rough comparison (although it may readily be seen that many interesting traits are lost by contraction into 5 cm.-groups).

Although the four curves are very dissimilar, they still show some common features.

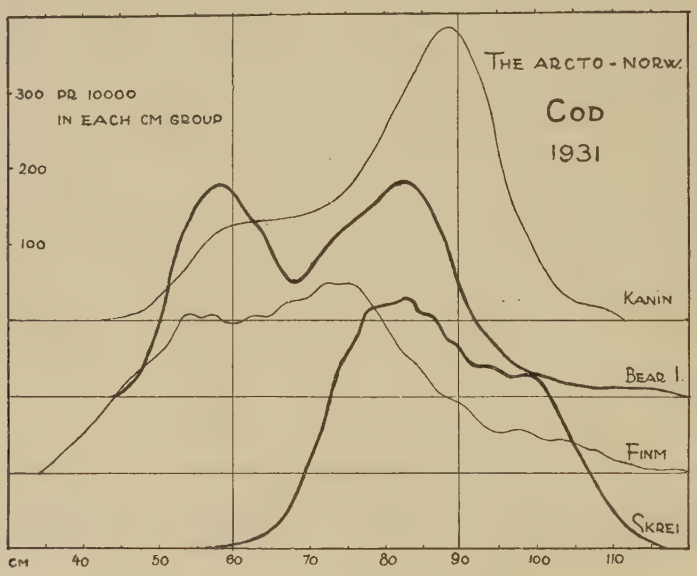


Fig. 1. Frequency distribution of trawl-caught cod at Cape Kanin and Bear Island (German measurements, 5-cm-groups) and of line caught cod from the Norwegian coast (cm-groups).

In the Barents Sea and at Finmark a strong group of fish of 50—60 cm. is conspicuous, corresponding to the 1926 brood and another maximum at about 80 cm. which contains a majority of the 1922 brood at Bear Island and as "skrei" (spawners) along the coast of Norway. The skrei contain also a considerable amount of fish of about 100 cm., mainly attributable to the 1919 brood. The Kanin measurements show a maximum intermediate between the two skrei maxima and apparently containing important contingents of the broods 1920 and 1921 which also are by no means negligeable among the skrei. The comparatively very rich output of the skrei fisheries in the later years is in fact partly conditioned by the unbroken succession of good broods of the years 1919—22 even if the intervening two broods were much smaller than those of 1919 and 1922.

In order to compare the frequency distributions found during the Norwegian coastal fisheries with the conditions obtained during the last ten years, the series for each half month and each part of the coast have been combined after due consideration

and expressed as percentages of the mean curve (1913—31) for each cm. as shown in fig. 2. It is apparent that the fisheries have in the last five years depended on the old and oldest year-classes at an increasing rate. Only last year a decided improvement was observed in the quantity of small fish at Finmark, the year-class 1926. At the time of writing (April 1932) it is reported from Finmark that these smaller fish are returning this year in appreciable quantities. As the trawl catches in the Bear Island region also show important quantities of the corresponding sizes, one may expect a change towards smaller sizes among the cod catches generally during the next two or three years at least.

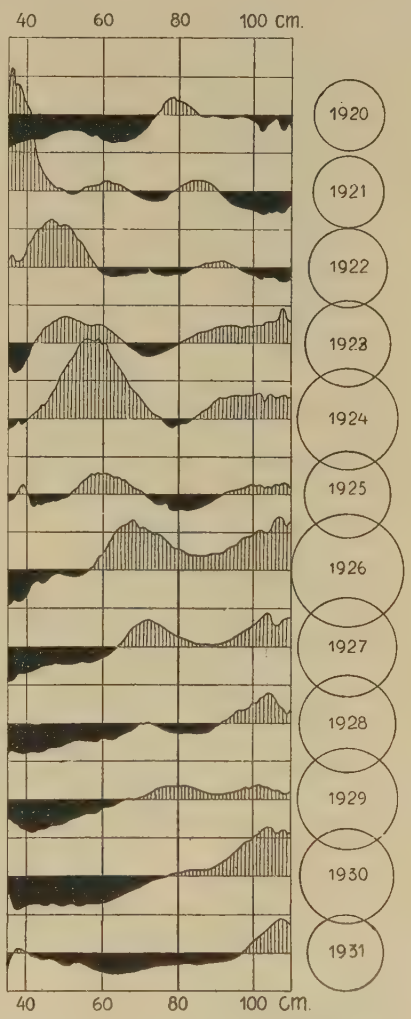


Fig. 2. Yearly frequency distribution of cod on the coast of Norway expressed as percentages of the average distribution during the period 1913 to 1931. The circles denote relative yearly quantities.

It would of course be of the highest interest if it were possible to give definite, even if only approximate figures for the relative strengths of the year-classes, but as pointed out earlier (Sund, Journal du Conseil, II, 2, 1927) the scale method gives only very imperfect data and these will in any case apply only to a very small fraction of the material treated by measurements. It seems therefore very fortunate that a closer study of the measurement series for a number of years appears to open a way to calculate the relative number at least of the 5 or 6 younger year-classes of the commercial catches, i.e. for the ages 5 to 10 or 12 years. This possibility rests on the following four sets of observations:

1) If the skrei measurement material for a single year, preferably obtained by the "blind" measuring method, is divided up into appropriate portions, e.g. halfmonthly series for each place of fishing as it is shown in fig. 2, it will be seen that the curve tops (after subtraction of the mean series for 1913 to 1931) occur very nearly at the same abscissae (cm.) in all curves. This is equally apparent in the corresponding series for 1930 not shown here and also some earlier years investigated in this respect, namely at the lengths 65, 72, 78, 83, 88, 92, 97, 101 and possibly 104 and 107, with exceptions amounting in no case to more than 2 cm.

2) Even if the counting of year rings on the cod scales may lead to erroneous results in a large number of cases, the measurements of zone widths and thence the calculation of the yearly length increments may be considered reasonably safe and it

so happens that the last increment before catch fits very well with the distances between the curve tops which therefore may be regarded as in some way connected with the several year-classes. They need not necessarily in all cases represent median lengths, this can only be the case if the distance between two successive tops is more than 2.2 times the standard deviation for the particular sizes. The yearly growth is large enough to fulfil this condition only in the case of the ages lower than 8 years. The curve tops will therefore in the right hand portion of the curves be located about half-way between the median lengths.

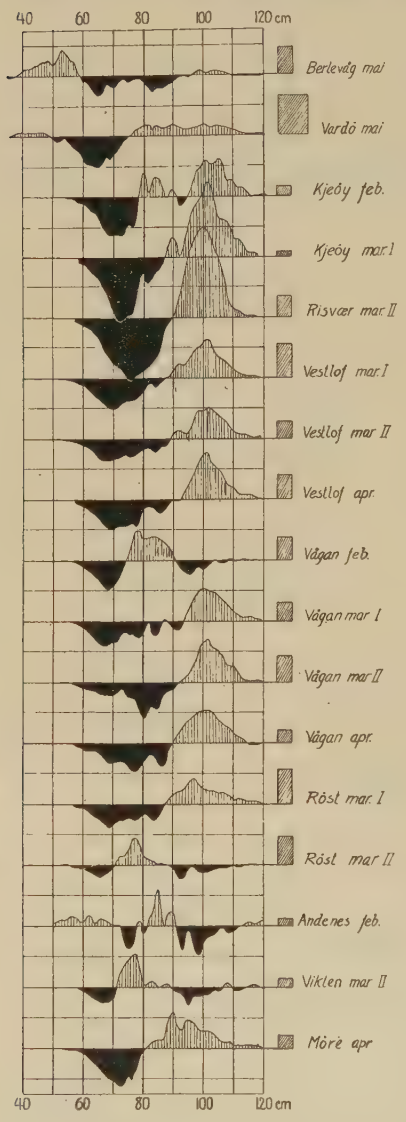


Fig. 3. Cod measurements on the coast of Norway in 1931, expressed as difference curves from average distribution 1913 to 1931. Excess curve areas shaded, deficit areas black. Two uppermost Finmark in May, the other skrei at different points of the coast, mostly in the Lofoten area, February to April.

3) When speaking about the standard deviation it is of course assumed, that the cod of a certain age varies in length according to the binomial formula. That this is so, can be directly demonstrated only in the few cases where reasonable certainty exists as to the homogeneity of the material in point of age and origin. Thus such pure binomial series are found in many cases among the 0-group of cod and also very often among the 0-group of herring. (These small fish will have to be measured in millimetres in order to show this.) Very strong evidence is also gathered from the study of the 1920 catch which undoubtedly contains a majority of 8-year olds and few others. Accessory evidence may also be gathered from the frequency distribution of grown herrings where age determination is almost infallible. These distributions are strictly binomial and have a very small standard deviation, about 3 % of the median size. If now the binomial nature of the frequency distributions of the grown cod is assumed, it leads to the result that the magnitude of the standard deviation in the cod curves is very nearly 3 % of the median size. This is the value found for all simple distributions of 0-groups cod and the same magnitude was found when trying to resolve the 1920 curves for skrei into year-classes. I also tried standard deviations of 5 and 6 % of the median sizes, but this left the peak of the curve undistributed. A smooth solution by means of the method of least squares can only be obtained when assuming a standard deviation of 3—3.5 % of the median size.

4) It is here assumed that the standard deviation is a fairly constant fraction of the median size for

each of the year-classes in question or at least a continuous function even if these year-classes admittedly are composed of very dissimilar 0-group individuals (the dissimilarity caused by differences in spawning time and feeding grounds etc. in the first year). Even without any correlation between the yearly increments and the length of the fish, the distribution will tend to become relatively narrower with increasing age and size. As

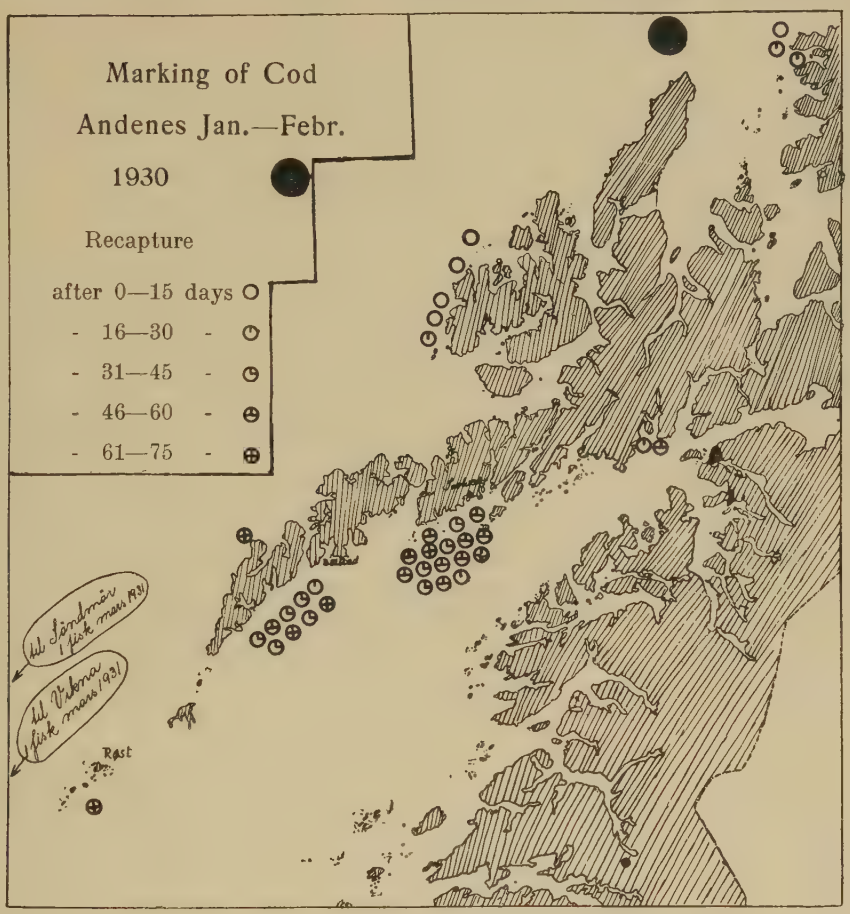


Fig. 4. Chart of Lofoten area showing recaptures of cod marked at Andenes Jan.—Feb. 1930. Nr. of fish marked 900. Each ring denotes a recapture, the number of radial bars giving the period in liberty, one bar for each half-month after the first. The two recaptures in 1931 were made outside this area, one at Søndmør (lat. 63), the other at Vikna (lat. $64^1/_2^\circ$ N).

a matter of fact there seems to exist some slight negative correlation between the size of the fish and the ensuing increment. On this point evidence from scale measurements is considered to be utilisable even if a part of the material is indeterminate as to age by one or two years. The available material is therefore being worked up from this point of view.

In order to obtain new and better evidence as to the correct median sizes of the

different year-classes otolith material has now been collected. The length frequency distribution of the skrei during the period of observation indicates that the means for each of the skrei year-classes vary but slightly, apparently less than 1 cm from year to year. This is the more probable as these fish of 7 years or more will have lived through both some good and bad seasons and in the course of their life have lived in many different parts of the area of this stock of cod.

Note on the Migrations of the Cod and Current Velocities.

The cod marking experiment at Lofoten in 1913 showed that the greatest northward directed speed of cod returning from the spawning grounds was about 25 km. a day which fitted well with the general velocity of the coastal current.

Fresh evidence as to the southward migrating speed of cod approaching the spawning grounds has now been obtained from a marking experiment at Andenes (lat. 69° N.) in January 1930. At this place where the continental shelf is at its narrowest, the fishing is carried on with bottom long lines at depths of 400 to 500 metres. The chart, fig. 4, gives the result of the recaptures up till now. It will be seen that the greatest speed attained is of the order 13 km a day. (One fish was caught 30 days after liberation (at Andenes) in the innermost part of the West Fjord, about 350 km. distant along the route most probably followed by the fish.) Now the currents calculated from sections across the continental shelf in the neighbourhood of Andenes show velocities towards the South of about 7 km a day at depths of 300 to 700 metres just outside the narrow Atlantic current found there, and the eastgoing currents in the West Fjord have sometimes still greater speeds, up to 15—20 km. a day in the fishing depths along the east side of the Fjord where fishing is done in the earlier part of the season. It is therefore quite possible to regard the currents as the predominant cause of the displacement of the cod shoals.

NORTH-WESTERN AREA
1931.

By

Johs. Schmidt.

The following work has been carried out by the various countries:

England.

No work has been done for the North Western Area Committee during the past year.

France.

During 1931 l'Office des Pêches sent to Greenland the Commandant Beaugé who spent about a month on the fishing grounds, leaving France at the end of September and returning November 10th. His observations have been included in a report which will be published in the "Revue des Travaux de l'Office des Pêches Maritimes".

Germany.

In the Wesermünde market Dr. Lundbeck has made a number of measurements and age-determinations, chiefly in the spring of 1931. Altogether 6100 measurements were made on Iceland fish in this year, mainly on haddock and cod, and of each of these two species 200 age-determinations were made by means of the scales. A thorough and systematic investigation of the landings from this, for the German fishery, most important fishing region has been planned. The financial stringency, however, makes it doubtful if detailed investigations can be started already in 1932.

Norway.

Oceanographic and fishery investigations were carried out on the part of Norway through two expeditions, one organised by the Directorate of Fisheries under the leadership of Mr. Thor Iversen, the other by "De Norske Svalbard og Ishavsundersøkelser" directed by Dr. Adolf Hoel.

1) The first of these expeditions used the sealer "Veiding" and carried out the following cruises:—

15th—20th July from Balstad (Lofoten) to Siglufjord, Iceland; 7 hydrographical and plankton stations.

22nd July to 7th August from Siglufjord to Denmark Straits; 30 stations with oceanographical observations, 23 fishing experiments with different sorts of gear (hooks); 200 cod also were marked and liberated and 100 collected for race investigations.

13th—18th August in the waters near Jan Mayen 5 hydrographical stations and 12 fishing experiments with lines etc. and drift-nets, yielding among other things 100 cod for racial investigations and 1 barrel of herrings prepared for age and other determinations.

18th—25th August northwards to the ice margin, 2 stations.

25th August 1 station near the ice margin in latitude of the Belgia Bank, also line fishing experiment at a depth of 306 m.

2) The expedition led by Dr. Hoel in the "Veslekari" continued the sounding and charting of North-Eastern Greenland waters begun last year, and the output of work of this kind was for both seasons charts in 1 : 100,000, covering an area of 1200 square kilometers. In the coastal waters, including the ice-fringe and some of the fjords of N.E. Greenland oceanographical observations were made at 21 stations; at some stations also plankton hauls as well as bottom samples and zoological dredging.

3) The Directorate of Fisheries has instituted a thermograph service on the route Bergen—East Iceland, working since July last. It is contemplated to open a similar service on the other Norwegian line to Iceland, Bergen—Reykjavik, and it will probably be working from July next. Then a number of temperature route-diagrams with corresponding salinity determinations at points about 40 miles apart will be available every month. (The East Iceland connection is monthly, the Reykjavik line fortnightly).

Scotland.

During the year the Scottish Research Vessel "Explorer" made two excursions into the area when routine hydrographic, plankton and trawling experiments were carried out. The trawling positions were selected mainly with a view to age-assessment of the haddock shoals. The first cruise in February—March, which included a survey of the grounds to the north of Scotland, was extended to the edge of the Continental Shelf off the Butt of Lewis. In May a hydrographic section between Ve Skerries (Shetland) and Trangisvaag was examined, trawling experiments were made round Faroe and Faroe Bank and a hydrographic section between Faroe Bank and the Butt of Lewis was examined on the return journey. Ten surface drift-bottles were liberated at each observation station during the cruise.

In contrast to the conditions on the North Sea plateau with regard to the haddock populations, the year-class 1928 was extremely poorly represented in the trawl catches both at Faroe and Faroe Bank. The two younger year-classes were well represented in these areas, thus once again demonstrating that good or bad years for haddock brood survival are not necessarily synchronous in all regions.

Denmark.

R/S "Dana" carried out a cruise in the northern Atlantic from May 14th to August 15th. The route was through the English Channel to the waters round the Azores and from there north to Reykjavik. The chief object was to investigate the distribution of the larvae of the common eel of the I- and II-groups; it appeared from this that the II-group, in agreement with earlier observations, occurred in rich quantities outside the 1000 m. line S.W. of the British Isles. The I-group was found to be dominant in the hauls N.E., N. and N.W. of the Azores, and in much greater quantities to the north than to the south of those islands. Further, a large material was gathered of other pelagic organisms *i.a.* Conger larvae, and hydrographical observations were also taken.

Iceland. From the west coast of Iceland to East Greenland (Latrabjarg to off Angmagsalik) a pelagic section was made in connection with hydrographical observations and liberation of surface drift-bottles. By this means it was determined for the first time that pelagic cod fry were found right out in the Denmark Straits over towards the east coast of Greenland. Along with this drift way from Iceland the often described occurrence of pelagic cod fry along the W. and N. coasts of Iceland etc. was also followed later, — the drift which supplies these coasts with young cod.

In Faxe Bay the trawlings regularly undertaken since 1924 were continued, within and outside the territorial waters.

In Vopnafjord on the N.E. coast 227 plaice were marked and liberated, to elucidate the wanderings of the young plaice at the present time by comparison with earlier observations.

The usual search for young fish was also undertaken in a number of fjords.

With the aid of the Danish inspection ships pelagic and hydrographical material was collected.

Assisted by the Icelandic inspection ship "Thor" 1496 large cod were marked during the spawning season at the Westmanna Isls.; up to 1st March, 1932, 91 of these (6.09 %) were recaptured, 7 from West Greenland; these 7 specimens amounted to no less than 8.33 % of those recaptured at Iceland (84 specimens). Later in November 118 cod were marked off Siglufjord. The material of measurements and otoliths of cod collected during the years 1928—29 and 30 has been worked up and described by Dr. phil. Å. Vedel Tåning in his paper: "Fluctuations in the Stock of Cod in Icelandic Waters" (Medd. Komm. Havunders. Ser. Fiskeri Bd. IX. 1931).

The study of these fluctuations has been continued by Mag. scient. Arni Friðriksson for the "Fiskifélag Islands".

In the course of the year Dr. phil. P. Jespersen has been working on the plankton material and contents of herring stomachs collected on the north coast; see his paper "On the Food of the Herring in Icelandic Waters", Medd. Komm. Havunders. Ser. Plankton, Bd. II, 3, 1932.

Greenland. Marking of cod at West Greenland was carried out by Cand. mag. P. Hansen (Greenland Directorate) to the number of 1446 specimens, and by Commander Chr. Ries, 244 specimens, who has also made hydrographical observations at West Greenland on board the Inspection ship "Hvidbjørn". We can now record

altogether 50 recaptures of marked cod, liberated at West Greenland in 1924—30 and retaken at Iceland.

Faeroes. Further study of the cod fluctuations has been made by means of 3089 measurements and 337 otoliths.

The fjord investigations have been continued.

Whales. The collection of statistics has been continued at Greenland and the Faeroes.

Race investigations. Investigation of the races of cod in the North Atlantic waters has been continued; investigations on the haddock (*G. æglefinus*), green cod (*G. virens*) and the sea-scorpion (*Cottus scorpius*) have been commenced.

PLATEAU CONTINENTAL ATLANTIQUE

1931.

(Atlantic Slope).

Par

Ed. le Danois.

Les croisières effectuées par les soins des gouvernements d'Espagne, de France de Grande-Bretagne, d'Irlande et de Portugal se répartissent de la façon suivante:

Espagne:	Pas de navire disponible.
France:	Sorties du navire "Estafette" de la Marine Nationale en Avril et Août.
	Croisières du thonnier "Flibustier" en Mai et Juin.
Grande-Bretagne:	Sorties mensuelles du navire "Salpa".
	Croisières du navire de recherches "George Bligh" en Août.
Irlande:	Sorties du navire "Muirchu" en Février, Mai, Août et Décembre.
Portugal:	Observations océanographiques de "l'Albacora" de Mai à Septembre près d'une madrague.

Le tableau ci-joint donne une vue d'ensemble de ces diverses croisières.

Le Rapport Atlantique 1931 contiendra essentiellement les données hydrologiques résultant de ces diverses sorties ou croisières.

Au point de vue biologique, il convient de citer l'excellente étude sur le merlu qui à été faite par MM. Hickling et Belloc à bord du navire de recherches anglais le "George Bligh". En dehors d'une importante documentation destinée à éclairer la biologie de ce poisson, MM. Hickling et Belloc ont procédé à des marquages de merlus qui peuvent fournir d'utiles indications sur les migrations.

En exécution des décisions prises à Lisbonne, lors de la Conférence du Comité spécial d'experts désigné pour étudier les méthodes scientifiques à appliquer à l'étude

des sardines, des travaux sur ce clupe ont été poursuivis, notamment en France, en Espagne et au Portugal.

L'étude des fonds de chalutage de harengs de la région des Smalls et d'Inishtrahull a été effectuée par M. le Gall, à bord d'un navire de la Marine française, conformément à l'article 8 du programme d'étude du Comité.

Enfin, M. le Professeur Joubin a continué la publication régulière de fiches faunistiques concernant les poissons du Secteur d'étude du Comité.

1931	Grande-Bretagne	Irlande	France	Portugal	Espagne
Janvier	Salpa	....	....	....	pas de navire disponible
Février	Salpa	Muirchu	....	....	
Mars	Salpa	....	....	....	
Avril	Salpa	....	Estafette	....	
Mai	Salpa	Muirchu	Flibustier	observations océanographiques de l'Albacora de Mai à Septembre près d'une madrague	
Juin	....	....	Flibustier		
Juillet	Salpa	....	....		
Août	Salpa George Bligh	Muirchu	Estafette		
Septembre	Salpa	....	....		
Octobre	Salpa	....	....	....	
Novembre	Salpa	....	....	....	
Décembre	....	Muirchu	....	....	

COMBINED NORTH SEA AND EASTERN CHANNEL COMMITTEE

1931.

By

G. Gilson.

The extensive reports of the Chairmen of the two North Sea Committees, Prof. Mielck and Dr. Bowman, show that both biological research and fishery work have been carried out in 1931 with great activity, in all parts of our seas. In fact the enormous amount of new information collected is really bewildering. It is now above human possibility, for an individual worker to keep "au courant" of the progress realised and to grasp the meaning and value of all the results obtained in all branches of the Exploration of the Sea. More than ever, specialisation and association are an absolute necessity.

An important part of the function of this Committee is to promote the formation of working associations of specialised pioneers engaged in definite research restricted to biologically and physically related districts of the sea.

I am not unaware of the extreme difficulty of the task, if it was to be applied at once to all groups of workers that might possibly be associated both for work and for immediate intercommunication of results. But that is no excuse for attempting nothing in a promising direction.

1. The first step to be attempted appears to be the organisation of meetings of experts, like the herring meeting held in 1930 at Lowestoft with such excellent results.

2. But, useful and even necessary as are these general meetings of experts, they leave room for particular working associations between men engaged in the study of definite problems in different parts of a region.

As an instance let us consider the case of the herring study in the intermediate region between the Southern North Sea and the Eastern Channel. We want to acquire exact data about the characteristics and life conditions of the two herring populations frequenting the two regions. They differ by certain characters not yet sufficiently defined, such as the mean number of vertebrae, time of spawning, rate of growth, etc. Are these two groups biological races or only varieties acquiring peculiar characters through the action of environment after a certain number of successive generations? What is the age-composition of their different shoals? How far do these shoals penetrate from the Channel into the North Sea, or conversely, from the North Sea into the Channel? Are these movements always connected with an inflow or a regression of Atlantic water? Many other

questions arise about intermixture, interfecundation, spawning times and grounds, concentration, dispersion, behaviour of spent herrings, fate of larvae under the action of currents prevailing at the time of hatching or of residual currents later on, etc. etc.

Extensive researches on this regional herring and the relevant hydrographical observations were carried on, this year, in the southern North Sea and in the Channel by Messrs. Le Gall, Hodgson and Carruthers. As well as our own work on spent herring along the Westcoast[1]) they have shown that many problems can only be solved by combined efforts and simultaneous observations in different parts of the southern area. International co-operation is necessary and work should be divided between the Laboratories of Lowestoft, Boulogne, Ostend and Helder. A preliminary agreement could be discussed in this Committee, and a definite programme could be arranged at the meeting of herring experts proposed to be held at Boulogne early in 1933.

3. The same necessity of combined action has been felt by the workers of the Southern North Sea Committee, who, under direction of Prof. Mielck, are carrying on continuous researches on the distribution and frequency of young flatfish in inshore waters.

Our particular work on littoral fishing has been carried on since the publication of the first part in 1928. The results obtained show that the amount of young fish and invertebrates destroyed has increased enormously since motors have been adopted by all of our fishermen, with a corresponding increase in size of the crafts engaged in shore fishery.

The increase of the alarming destruction is also connected with the development of the fish-meal industry.

Our results confirm the necessity of long series of observations to avoid errors connected with seasonal changes, gregarious habits of fish, and many other causes. They also show the desirability of associated co-operation and unification of work, if we want to accurately measure the damage caused by the important shore fishing and shrimping that is carried on all along the continental coast, from Belgium up to the North of Jutland.

4. I am also aware that several of the workers engaged in northern explorations are of opinion that associations for simultaneous work in various parts of a region are necessary.

5. As a preliminary basis for a general agreement for combined work, I would suggest the following items:

1) Frequent intercourse between the workers of the different laboratories in the region.
2) Division of work by mutual agreement in different parts of the area, according to means of work available in each of the countries interested: laboratories, ships, staff and personnel, financial means, landing statistics in fishing harbours, etc.
3) Admission of assistants in laboratories and on ships, with the view of unification of ways and methods.

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[1]) G. Gilson. Recherches sur la Biologie du Hareng "Guai" etc. Annales de l'Institut d'Etudes Maritimes d'Ostende. Mémoire 1, 1931.

4) Permission for the ships of the several countries, engaged in the work, to carry on research, even with fishing gear, in territorial waters, under the blue flag of the International Council.
5) Agreement as to the publication of particular parts of the results by one or more members of the group.

This scheme could be applied to many kinds of particular work in different regions, as for instance, researches on herring, sprat, pilchard, cod, haddock, mackerel, plaice, young fishes, hydrographical and planktonic problems etc.

It would need neither creation of new Committees nor any other administrative complication or expense except certain travelling expenses for which suitable subsidies should be granted by the Council on application by the Chairmen of existing Committees. Co-operation would certainly lead to sparing of efforts, time and money and to the undelayed obtaining of safer conclusions.

There is another matter of co-operative aspect that we all have heard of in fishery countries: it is the question of supplying practical information to the fishing industry.

It is scarcely necessary to remind the fishing public that the International Council is a progressive Institution whose aim and function are the advancement of the science of the sea and sea productions, with the view of supplying the Governments with positive data for effective protection of fishing grounds and for rational direction of fisheries. We are not expected to simply act as pointers and to direct individual ships or fleets to places where big hauls are likely to be obtained. The detection of dense shoals is a part of the fisherman's craft, and our research ships and laboratories have other destinations, more useful to the generality of the industry and to the people at large.

However, we are by no means opposed to intense fishing, as long as it remains within the limits of rational utilisation of natural products of the sea. We are even dis posed to supply the intelligent ship-owner and fisherman with general directions to help him in his search for economical obtaining of large quantities of fish which he wants to sell at the highest possible price.

6. The setting up of an international prediction service for herring and haddock in certain localities is even contemplated, as a bold attempt in a co-operative direction.

7. Publication of tracts by associated writers, both biologists and fishery-men would be very useful, if kept up to date by frequent reprinting of new editions.

8. Some of us have tried to go even further than that in the way of a rational direction of fishing and informations by helping progressive ship-owners to discover able men and to train them to do useful work on board of their ships, observing depth, temperature, salinity or density and currents, taking scales of herrings, measuring thousands of fishes, and writing down lots of notes and figures. The results of the work of these men might be made use of for scientific research, if agreed by the director of a laboratory engaged in the study of the particular region, and transmitted to others for co-operative work. Some of the observations made by these men might even supply to an intelligent skipper

directions for actual fishing, as, for instance: depth, nature and configuration of the bottom in the region, temperature and density at different depths, colour and quantity of plankton (HARDY), etc. The only objection is that in the hands of men imperfectly acquainted with the innumerable causes of errors met with in biological work, scientific information is a double edged weapon: inadequate calculations and incorrect conclusions may lead to dangerous deceptions and draw the fishing in the wrong direction.

9. Finally there is an other idea, less risky and more in the line of co-operation for actually helping the fishing in action: that of the setting up of a rapid international intelligence Service, through which all kinds of practical information could be communicated to fishery centres and, from these, even to ships actually fishing at sea. Abundance or scarcity of fish, success or failure of fishing at the time in certain localities, age-composition of shoals from scales, presence or absence of attractive or repulsive plankton, changes of salinity or temperature on certain lines, prediction or probabilities from continuous laboratory observations, etc., etc., could be announced by telephone, when very urgent, and a flying bulletin could be printed and circulated.

Information collected in large fishing harbours and fishery laboratories should be centralised in an important place with ample connections — let us say London — from where they should be telephoned and printed leaflets sent out to all important fishing places bordering the North Sea or even outside of its limits. A staff of trained men would be necessary for collecting data: one fishery expert and one clerk, each possibly occupied at other work besides, would be sufficient and could be found in all important places like Lowestoft, Yarmouth, Grimsby, Hamburg, Ymuiden, Ostend, Boulogne. Two agents also would be needed to do the work in the central office, consisting in reception, printing and distribution of all kinds of information.

Some money, of course, must be found to face all the necessities of the service, and it seems that the International Council could not be begged to support alone the whole weight of the expense. Subscriptions for the reception of the leaflets and other information would go far towards the completion of necessary resources.

Obviously this is only a preliminary sketch of organisation; I do not consider the setting up of such a service as a simple and easy task. Difficulties of various kind must be overcome, among which rivalry and a dislike towards helping the foreigner will be foremost, in all countries, among the lowest ranks of the profession. In fact, it seems likely that only large trawlers and drifters fishing in distant parts of the sea would get advantage out of information from headquarters of the intelligence service. Small crafts would obtain very little benefit out of an international organisation.

However, I have shown elsewhere that very effective local information could easily be supplied to them during certain seasonal fishings in the littoral zone: the spent herring and the sprat fishing[1]). Research ships could weekly explore coastal waters and point out the localities of maximum concentration of the shoals to the fleet of small motorboats, without much interruption of their own work.

An international intelligence service is desired in fishing circles of several countries. Combination of efforts is the method of the future.

[1]) G. GILSON. Loc. cit. p. 63.

NORTHERN NORTH SEA

By

Alexander Bowman.

General.

The attainment of a comprehensive and detailed moving picture of the changing physical and biological conditions occurring throughout the year in the extensive and complex area of the Northern North Sea is a task which is at present beyond the means of investigation available to the Committee. With the limited resources at their disposal the policy of concentrating the more detailed biological researches on the herring and haddock, the two most important commercial species within the area, has therefore been continued.

While the yield of the commercial fisheries was ascertained by the routine collection of monthly statistical data of the quantities and values of the different species landed the special trawling experiments were directed mainly to an age-assessment of the haddock shoals. In the conduct of the herring investigations the recommendations drawn up by the Herring Experts at their meeting at Lowestoft in November 1930 have been adopted, as far as possible, for the analysis of the complex herring shoals and more particularly for those of the north-western area.

In view of the changes which are taking place in the conduct of the inshore fisheries Scotland has given increased attention during the year to the investigation of the populations of small plaice which occur within different sections of the Scottish coastal zone.

On all the fishing cruises hydrographic and plankton observations were carried out as an integral part of the programmes of research, the plankton stations being selected chiefly with a view to determining the distribution of herring and haddock larvae.

In France the investigations in the Northern North Sea have been concerned with the biology of the mackerel of the Fladen Ground and of the region of Udsire, as well as with the trawled herrings of the Fladen Ground. Measurements have been taken of mackerel landed by trawlers returning from voyages to the Fladen Ground, to Bressay Shoal and to the region of Udsire. Data are also available regarding the maturities of the mackerel and collections of otoliths have been made for further study. Regular observations have also been carried out on the trawled herring catches from the Fladen Ground from July to October.

In the Fisheries Laboratory in Hamburg the statistics of the German herring fishery — trawl as well as drift-net — have been elaborated and detailed reports have been published[1]). Moreover the study of the German drift-net fishery for herring has been continued on the basis of a large number of log-books placed at the Laboratory's

[1]) H. Lissner. Der deutsche Trawlheringsfang 1930. Fischerbote 1931.
H. Lissner. Die deutsche Heringsfischerei mit Treibnetzen i. J. 1930. Berichte der D.W.K. N. F. VI. 1.

disposal by the skippers of the drifters, and the data from these books for 1930, plotted on charts, have been published as heretofore.

At the beginning of 1932 it was possible to collect and to publish also the statistics of the German herring fishery during 1931[1]) and to state that the landings last year amounted to 416,437 kantjes (i.e. sea-packed barrels) of cured herring and 73 millions kg. trawled fresh herring — record quantities unprecedented in the last decades of the German herring fishery.

As in former years the data of the number of landings by the different types of Scottish drift-net herring fishing vessels and the total quantities of herrings landed at the various ports, published in the Annual Reports of the Fishery Board for Scotland, have been supplemented by the collection of more detailed information regarding the productivity of the different fishing grounds.

At the opening of the Scottish summer drift-net herring fishery log-books of more simplified form than those formerly in use were issued to a number of drifter skippers. In these log-books provision is made for the entry of essential information such as date and place of capture, quantity caught and description of the catch, while ample scope is given for additional notes. The books are inter-leaved so that a duplicate copy of the records can be kept by the skipper. Day or quay books were also provided for the use of District Fishery Officers in which the essential data obtained from other units of the fleet can be entered. The Scottish method of landing the drift-net catches daily offers the necessary facilities for the collection of such data.

The more detailed analysis of the herring shoals has been carried out by the examination of numerous quarter-cran samples caught by drift-net and trawl. Such samples are forwarded regularly to the Laboratory at Aberdeen during the fishing season from the principal fishing centres according to a pre-arranged programme. Additional data, more particularly regarding the occurrence of the younger year-classes in the coastal zone, have been secured from the catches made by the Research Vessel "Explorer" and by the Motor Boat "Enid" by means of small meshed nets.

The abundance and distribution of the demersal marketable species in the North Sea as ascertained from the combined English and Scottish data of the monthly landings from each unit statistical area have been tabulated by the Ministry of Fisheries (England). On the various fishing cruises of the Research Vessel "Explorer" records of the catches of the commercial species by standard otter trawl have been kept as part of the routine work. The selection of the trawling positions was made chiefly with a view to the age-assessment of the haddock stock and to supplement the ichthyometrical data obtained from the commercial catches landed at Aberdeen Market.

Work at Sea.

Hydrological observations were made by France throughout the period of the summer herring fishery from the Fishery Service Vessel "Estafette". Observations were

[1]) H. Lissner. Ein neues Rekordjahr des deutschen Heringsfanges. Fischerbote 1932.

also made by the "Capitaine Armand" on the edge of the "Norwegian Deep" during the season of the mackerel fishery.

A hydrological study of the region of the Fladen Ground was made during August 1931 for comparison with similar observations carried out on the herring trawling grounds of Inishtrahull and of the Smalls. These observations are to be the object of a special communication.

In the interest of the herring investigations continued in the Hamburg Fisheries Laboratory a trip with the German Naval Fishery Survey Vessel "Frauenlob" was undertaken by Dr. Lissner and an assistant from July 13th to August 16th in order to collect material for the comparison of trawl caught and drift-net caught herring.

In June—July Holland carried out investigations with H. M. Patrol Cruiser "Nautilus" along three parallel sections between Shetland and the Norwegian coast. Hydrographic observations were taken at different depths at stations selected at regular intervals. Trawling experiments, chiefly for haddock, were made on Ling Bank and on Viking Bank and herring samples caught by drifters fishing south-east of Shetland and on Bressay Shoal were procured for detailed examination.

The Scottish Research Vessel "Explorer" was kept in commission for the greater part of the year, operations commencing in the second half of February and concluding in the first week of December. As in former years routine hydrographic, plankton, and trawling observations were made at selected stations on all cruises, the itineraries being undertaken chiefly to maintain the continuity of observations on the haddock and herring species. At intervals surveys were carried out on the small plaice population in the shallow zone of the Scottish East Coast and these researches were supplemented by trawling and seine net experiments with the Motor Boat "Enid". Fishing experiments for crabs and lobsters were also made by the "Enid" throughout the year.

The following is a brief summary of the itineraries undertaken and the main objects of investigation on each cruise.

February—March: Itinerary:—Aberdeen — Pentland Firth — North Rona — Edge of Continental Shelf — Norup Deep — Foula — Muckle Flugga — East Shetland — Fair Isle passages — Moray Firth — Aberdeen.

General hydrographic and trawling survey. The distribution of the newly hatched spring herring larvae of the north-western area. Small plaice population of the shallow coastal zone in the Moray Firth.

March—April: Itinerary:— Firth of Forth — Northumberland coast — Scottish shallow coastal zone — Aberdeen — Fladen Ground — Fair Isle — North-east Shetland — Viking Bank — Bergen Bank — Lerwick — Coral Bank — Long Forties — Aberdeen.

Age-composition of the small plaice population of the Firth of Forth and Scottish East Coast. The spring herring larvae of the Firth of Forth area. General hydrographic and trawling survey of the deep central basin of the Northern North Sea. The distribution of the haddock year-classes at the spawning period.

May: Itinerary:— Aberdeen — Dornoch Firth — Sumburgh Head — Ve Skerries — Trangisvaag — Round Faroe — Faroe Bank — Butt of Lewis — Muckle Flugga — Balta Sound — Aberdeen.
General hydrographic and trawling observations. Age-assessment of the haddock shoals. The herring larvae of the north-western spring spawning areas. The small plaice population of Aberdeen Bay.

June—July: Itinerary:—Aberdeen — Stavanger — Lerwick — Viking Bank — Lerwick — Fair Isle — Bressay Shoal — Wick — Fladen Ground — Aberdeen.
General hydrographic and trawling survey. The conditions prevailing on the summer drift-net herring fishing grounds. Observations on the small plaice population in the Moray Firth and Aberdeen Bay.

July: Investigations on the small plaice populations of the Firth of Forth and St. Andrews Bay. Food investigations.

August—September: Itinerary:— May Island — Great Fisher Bank — Ling Bank — Aberdeen — Fladen Ground — Dornoch Firth — Lerwick — Aberdeen.
General hydrographic and trawling observations. Age-assessment of the haddock shoals. Distribution of newly hatched autumn herring larvae. Small plaice populations of Firth of Forth and St. Andrews Bay. Plaice marking and transplantation experiments. Investigation of commercial seine net fishing operations in Firth of Forth and St. Andrews Bay.

September—October: Itinerary:— Firth of Forth — Aberdeen — Middle Bank — Inner Shoal — North edge of Dogger Bank — May Island — Scottish East Coast — Aberdeen — Moray Firth — West Orkney — Fair Isle — Foula — Muckle Flugga — Balta — Lerwick — Aberdeen.
General hydrographic and trawling survey. Abundance and distribution of newly hatched herring larvae. Age-composition of the haddock shoals.

October: Whitefish seine net experiments in St. Andrews Bay. Age-assessment of the small plaice population.

November: Itinerary:— Leith — Lowestoft — Spurn — Dogger Bank — Aberdeen.
Distribution and frequency of occurrence of unscaled herring larvae. Age-assessment of haddock shoals. Investigation of the small plaice populations in the Moray Firth and Aberdeen Bay. The small herrings and sprats in Inverness Firth.

December: Trawling experiments off the Aberdeenshire coast. The small plaice population of Aberdeen Bay.

In June and November Sweden carried out investigations in the Skagerak and eastern part of the North Sea. In June the main object of the cruise was to ascertain the frequency of occurrence of haddock larvae in the area, while in November chief attention was given to the distribution of herring larvae.

Herring.

It is probably true to say that a turning-point has been reached with regard to the study of the herring shoals of the Northern North Sea. Hitherto, the fact that there are two distinct spawning groups of herring of almost equal importance numerically in the area, one spawning in the spring months and the other in the autumn months of the year, and that the progenies of these groups, occurring as they do, in mixed shoals in very variable proportions, have not always been clearly distinguished from each other in the analysis, has tended to obscure the issue. The adoption of the recommendations of the Herring Experts, particularly with reference to the accurate description of the stages of maturity of the adults and the determination of the racial characteristics of the components of different degrees of sexual maturity in mixed shoals, should go far towards placing the analysis of the complex conditions on a more secure basis.

Not only are the main spawning grounds of the spring spawners distinct from those of the autumn spawners but no spawning — or hatching of larvae — occurs in the intervening months between the spawning periods. There are therefore *prima facie* grounds for the assumption that there are at least two physiological races in the area.

The major spawning grounds and the extent of the spawning periods of these two groups have already been determined with considerable accuracy from the records of occurrence of herring spawn in the stomachs of predaceous fishes and from the times and places of capture of small larvae still with yolk sac not completely absorbed.

Confirmation of the importance of the north-eastern region, along the western border of the Norwegian Deep, as a spring spawning area was obtained by the Research Vessel "Explorer" by the capture in the first week in April of large numbers of haddock gorged with herring spawn. Evidence of a spring spawning stock in the neighbourhood of the Faroe Islands was obtained by the capture of a number of very small larvae in that area in May.

As indicated in the summaries of the cruises undertaken by the Research Vessel "Explorer" the plankton observations were designed to trace as far as possible the dispersal of the larvae from the main spawning areas up to the time when the adult characters are acquired. The wealth of material relating to this aspect of the subject has been examined by Dr. Clark. The experiments yielded large catches of small larvae during the spawning periods in the vicinities of the favoured spawning places but, as in former years, the captures of larger larvae (over 30 mm. in length) on the offshore grounds are extremely few in numbers. There is, in fact, a somewhat abrupt disappearance of the larger larvae from the plankton collections taken on the offshore grounds which suggests that the more active forms are difficult to catch in representative numbers even with the large ring trawl.

Unscaled stages derived from the two great spawning groups are readily distinguished from each other, firstly by the differences in their size-frequency distributions in the several months of capture and, secondly, by the fact that metamorphosis is completed at a much smaller size by the spring brood than by the autumn brood. Our knowledge of the distribution, conditions of occurrence, and rate of growth of these transition stages, is still far from complete but the main point at issue is their relation on the one

hand to the younger larval forms and on the other to the fully scaled individuals of the 0-group.

In the early summer months the transition stages of both groups have been encountered sporadically all along the shallow coastal zone, of the Scottish East Coast. The relative importance of these two groups appears to vary greatly from year to year on different parts of the coast. No transition stages of autumn origin, however, have been observed on the west coast of Scotland although they have been captured on the west coast of Shetland.

The small scaled stages were located only in the estuarine and shallow coastal zone. Owing to the considerable overlap in the ranges of sizes of the members of the two groups in mixed shoals and to the habit of the species of shoaling by size and depth of water there are difficulties in separating the individuals of different origins from each other. Scale-age-determination offers no assistance for the separation as the progeny of the autumn spawners pass through their first winter in the unscaled condition. Owing to the break in the chain of evidence through defective methods for the capture of the larger and more active larvae on the offshore grounds the ultimate fate of the majority of the larvae originating from the great spring spawning centres of the north and west and from the important spring spawning grounds in the north-eastern region of the North Sea along the western border of the Norwegian Deep is still uncertain. Similarly the comparative absence of records of larger larvae from the plankton collections taken in the area between the Firth of Forth and the Dogger Bank in the later months of the year gives rise to uncertainty as to what quota of the autumn larvae originating from the more northerly spawning centre annually populate the estuarine and shallow coast zone of the Scottish coast and as to what quota is carried by the prevailing currents southwards and eastwards to various parts of the shallow southern North Sea.

Poulsen's contribution[1]) to our knowledge of the distribution of the larvae in September and October 1930 in the latter area as ascertained during a cruise of the Danish Research Ship "Dana" does not add appreciably to the elucidation of this aspect of the problem. The Swedish observations in November 1931 at three stations — Lat. 57°28′ N. Long. 8°25′ E.; Lat. 57°26′05″ N. Long. 7°53′ E; Lat. 57°27′ N. Long. 7°23′ E. — when hauls were made at 80 metres depth and near the surface with the large ring trawl gave negative results for herring larvae.

In Germany and in Scotland the analysis of the racial characteristics of these young forms occurring in the shallow zone has been undertaken. Further investigations, however, will have to be undertaken to show how far the peculiarities of the young herrings of the Southern North Sea, of the German Bight and of the Scottish coastal zone allow us to identify their racial characters with those of the spawning shoals of the Northern North Sea.

The regular observations carried out by France on the trawled herrings of the

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[1]) E. M. Poulsen. "On the spawning places of the herring in certain parts of the North Sea, the Skagerak, and Kattegat, in the autumn of 1930 and some earlier years." Medd. fra Komm. for Danmarks Fiskeri- og Havundersøgelser, Serie Fiskeri, Bind IX, No. 4.

Fladen Ground throughout the season have yielded the following results with regard to size-composition.

Size in cm.	22	23	24	25	26	27	28	29	30	31	32
Year 1931 Percentages	0.4	1.7	4.5	12.3	26.0	26.9	16.5	9.5	1.7	0.2	0.2
„ 1930 „	3.0	4.2	8.4	13.8	26.0	19.0	14.2	7.6	2.6	1.0	0.2

	Range	Mode	Mean		
Year 1931	22—32	27	26.71	±	1.01
„ 1930	22—32	26	26.37	±	1.24

The results show the weaker proportion of small herring (and also of very large herring) in the trawl net herring fishery from the Fladen Ground in season 1931.

Generally the mean maturities of the samples were not so far advanced in season 1931; the proportion of herrings at Stages IV to V was comparatively weak in September—October, Stage III still dominating at this period.

The following percentages give a comparison of the age-composition of the shoals in seasons 1931 and 1930.

Winter Rings	2	3	4	5	6	7	8	9	10
Season 1931 Percentages	0.8	23.4	18.3	13.3	18.6	11.8	10.3	2.8	0.6
„ 1930 „	3.8	9.5	15.2	27.3	22.0	14.3	5.1	2.3	0.4

The distribution shows the abundance of herrings with three winter rings in the shoals during season 1931 and inversely the feeble proportion of herrings with 5 winter rings.

The mean number of vertebrae calculated from the examination of 457 individuals during July—October 1931 was 56.68. The following percentage table gives a comparison of the distribution of the vertebral counts made in seasons 1931, 1930 and 1929 respectively.

	53	54	55	56	57	58	59
Year 1931 Percentages	—	—	2.6	35.0	54.0	8.1	0.2
„ 1930 „	0.2	0.4	4.2	29.8	57.0	8.6	0.0
„ 1929 „	—	—	3.1	32.4	51.2	12.8	0.7

The herring shoals which form the basis of the German fishery in the western North Sea have been analysed as in former years but the methods were extended to a certain degree according to the proposals adopted by the Lowestoft meeting of herring experts at the beginning of November 1930 (cf. Proceedings in the Rapp. et Proc.-Verb. Vol. LXXIV, p. 116). These proposals were intended to improve the former procedure of the investigators. As far as the German researches are concerned use of the Lowestoft proposals has been made in detail. This holds good especially for point 3 of the Agenda concerning the stages of maturity. The more exact distinction and denomination of the various stages of sexual development has been considered as a very important means for judging the composition of herring shoals occurring on different fishing grounds and for the separation of the composing elements. This,

however, must be regarded as a preferential task as the fact is recognised that all herring catches are mixed and usually consist of fishes of rather different origins.

Also the racial investigations undertaken by Dr. Schnakenbeck were intended essentially to afford reliable assistance in the discrimination of different components in the herring shoals of the North Sea. The results of these investigations which have been reported on at different occasions[1]) have not found general approval. They have, however, been continued at the instigation of Prof. Ehrenbaum by Dr. Lissner and these workers are still convinced of the usefulness and reliability of such studies.

Nevertheless it appeared useful to make certain alterations and amendments in the application of the procedure and these were found, e.g. in using a more exact and improved method of determining the stage of sexual development, in order to decide on the spring or autumn spawning character of the specimens in question. This was accomplished by determining for each single herring of a sample the proportion of the weight of the gonad to the total weight of the body, stage V of sexual maturity being given if the former weight is at least equal to 15 % of the total weight, whilst a weight of the gonad 10 to 15 % of the total weight denotes stage IV. Dr. Lissner finds the method quite a good one for distinguishing the different stages of maturity which has always presented difficulties.

With this expedient the above-named investigator was able to separate in a more reliable way the different forms of herrings composing the shoals in the western North Sea, and by applying this method to the analysis of all samples investigated it appears possible to arrive at a more satisfying and complete characterisation of the composing racial elements, and so much the more as it was found possible during 1931 to increase the number of samples of trawl caught and drift-net caught herrings from different fishing grounds to 35 samples of adult herrings with about 6,000 specimens.

As the principal means for the fixation of the racial character of fishes with equal maturity, considered as homogeneous, the counting of the vertebrae was accomplished as in former years and it is interesting to state that the frequency distributions of these counts show curves differing in a certain way from those given by Dr. Schnakenbeck on herring material of the same origin. Though the statement of the latter author as to the mixture of herring shoals in the north-western North Sea is maintained, it appears that the spring spawning shoals play a much greater — though always varying — part in the composition of the stock in the North, as already insisted on by the Scottish investigators, Dr. Bowman and Mr. Wood. In a similar way the herring population of the Dogger Region may be split up into autumn spawners of the same character as those further north and winter spawners which have to be identified with the so-called Channel herring.

In accordance with the recommendations of the Herring Experts that the International Council should be in possession of as complete data as possible on the

[1]) W. Schnakenbeck. "Zum Rassenproblem b. d. Fischen". Journal du Conseil, VI. 1.
W. Schnakenbeck. "Zum Rassenproblem b. d. Fischen". Zeitschr. f. wiss. Biologie. Abt. A. Band 21.

biological similarities and differences between drift-net caught and trawl caught herring to be in a position to advise in the event of the matter being raised by the commercial interests concerned arrangements were made for Dr. Lissner to embark on one of the Fishery Survey Vessels of the German Navy whilst it was visiting the German herring fleet on the Fladen Ground in July and August. In June the German drift-net fishermen secured good catches off Shetland but as the drift-net fishery in that area collapsed in the second week of July the German drifters were directed south (i.e. off the Firth of Forth) where large quantities of rather small herring were secured. Unfortunately, only rather limited opportunities to collect the material wanted were found as the drifters did not occupy the grounds north and north-west from the working places of the herring trawlers on the Fladen Ground and the samples acquired were not suitable for the intended comparison of herring caught on the same ground with different gear however interesting the material derived from drifters working off the Firth of Forth proved to be.

With all herring samples investigated also age-determinations have been executed to the same extent as in former years. The results show a strong prevalence (50—60 %) of four years old spring spawners, that is to say, of the year-class 1927. The year-class 1926 was not as numerous as might have been expected from the quantities in 1930. The Fladen Ground retained a considerable stock of the year-classes 1922 and 1923.

The stomach and gut contents of herrings collected on a former occasion on board were analysed by Sl. Muzinic and gave some interesting results concerning the hours of day and night at which the feeding of the herring is preferably going on[1]).

During the year 1931 eighty-eight quarter-cran samples of herring or a total of about twenty-seven thousand fish were examined at the Laboratory, Aberdeen, from the different herring grounds around the Scottish coast according to their seasons of productivity. Nineteen of these samples came from the west of Scotland — sixteen from the Clyde and three from Hebridean waters. The location of the remaining sixty-nine samples from the north and east of Scotland is as follows:—

Young Estuarine Herrings (0- and I-groups).
Beauly Firth (1); Firth of Tay (5); Firth of Forth (5).
Mainly Adult Spring Spawners.
Shetland (3); Viking Bank (2); Firth of Forth (3).
Summer and Autumn Shoals (May to October).
Shetland (8); Orkney (3); Wick (8); Fraserburgh (9); Peterhead (7); Eyemouth (7); Fladen (6); Gut (2).

In most cases, in addition to routine observations on size, sex, maturity etc. the gross weight and the weight of the gonads of each adult fish in a sample were ascertained. Two scales selected under the microscope were taken from each fish for age-determination and were mounted permanently for future reference if necessary. Increased

[1]) Sl. Muzinic. "Der Rhythmus der Nahrungsaufnahme beim Hering". Berichte der D.W.K., N. F. VI. 1.

accuracy in the enumeration of the scale rings has more than compensated for the labour involved.

Much time has been given to counting vertebrae and keeled scales in accordance with the programme approved at the Lowestoft meeting. In 1931 about 5,000 herrings were thus dealt with, the material used being derived from the following sources:—

Young Immature Herring.
Beauly Firth (640); Firth of Forth (540).
Adult Spring Spawners.
Shetland (310); Viking Bank (347); Firth of Forth (289).
Adult Herring (May—June).
Shetland (418).
Autumn Spawners.
Wick to Peterhead (882); Eyemouth (408).
Trawled Herring.
Fladen Ground (618); Gut (348).

The racial investigations have been carried out largely on spawning shoals and as the material includes a number of different year-classes it is hoped that it may also be sufficient to indicate the variation or constancy of body characters in fish of different ages caught on the same spawning grounds.

The analysis of the material which is being carried out by Mr. Wood, assisted by Miss Riddel, is still in progress.

Shetland.

In giving the number of rings on the scales, the ring formed during the winter 1930—31 has been counted, although it was not completed on the scales of the earliest samples examined.

The spring spawning shoals at Shetland showed a very mixed age-composition. The most important age-classes had 6, 7 or 8 winter rings on their scales. In the later shoals a change became apparent; fish with eight winter rings diminished in relative numbers and the group with five winter rings came into prominence. Fish with four winter rings were present in extremely small numbers. A sample of spawners caught in April included 10 per cent. of fish with only three winter rings (year-class spring 1928). Attention is directed to this age-group, not only because it is likely to make further important contributions to the spring spawning shoals in succeeding years, but also because a group with three winter rings formed the most important component in the shoals on the Viking Bank in April and in the early summer shoals on the east coast of Shetland. Here also it is of interest and importance to refer to the occurrence of enormous numbers of 0-group herrings in the Shetland coastal zone in the autumn of 1928 as mentioned in Rapp. et Proc.-Verb. Vol. LX, p. 102: "Herrings of the 0-group are, as a rule, only found in relatively small numbers in the Shetland coastal area in spite of its close proximity to important spring and autumn spawning grounds. The occurrence

of enormous numbers of small herrings in the Voes and Sounds round Shetland in October is therefore worthy of note. They were first observed towards the end of September when they had a mean size of about 9.5 cm. They remained in the vicinity throughout October disappearing therefrom about the first week in November. The shoals were exceptionally dense all along the west coast and also in the various Voes in Yell Sound. They were also equally numerous in Bressay Sound on the East Coast but appeared to be only in very small numbers east of Yell Sound and absent altogether from Unst Island. According to the statements of the natives a similar occurrence has not been observed during the life time of the oldest inhabitants."

As in the year 1930 the drift-net summer fishery at Shetland collapsed about mid-July and thereafter catches were extremely meagre. During the earlier and most productive period there was only one important age-group in the samples. This group with three winter rings on their scales constituted 51 to 65 per cent. of the shoals sampled. In August, during the normal spawning season, when the shoals were extremely sparse, the Shetland herring were, for the most part, still in the lower stages of sexual development and of the fish which did spawn in autumn on these grounds more than 50 per cent., had 7 or 8 winter rings — that is, the same two most important year-classes as in 1930. The group with three winter rings which constituted the bulk of the landings in June was next in importance although it contributed very few recruits to the autumn spawning shoals.

The majority of the autumn spawners in the north-western North Sea have reached maturity and spawn before the completion of the fourth summer zone on the scales. If, therefore, the fish with three winter rings which were so numerous during the earlier part of the fishery at Shetland had been autumn spawners, one would have expected this group to have predominated in the catches in August and the catches to have been much better than they were. Samples from the Viking Bank in April showed a close resemblance to those from Shetland in May and June, in that fish with three rings predominated over any of the other age-classes.

Analysing briefly the data concerning the distribution in extreme northern waters of this particular group which may be homogeneous and derived either from brood born in the spring of 1928 or on the other hand in autumn 1927, or which may be composite as a result of mixture between two such broods we find:—

(a) A proportion of these appeared at Shetland amongst the spring spawning shoals.
(b) They were abundant in April at the Viking Bank, a spring spawning area.
(c) They were abundant at Shetland in May—June but the majority left these grounds just at the approach of the autumn spawning season.
(d) Racial investigations show that they had a mean of 56.9 vertebrae, which is only slightly below the mean for the spring spawners of the Shetland area.

The weight of evidence therefore indicates that this particular group was composed for the most part of spring spawning fish which we know tend to leave the drift-net grounds about mid-July. With their departure the summer fishery collapsed as in 1930.

Orkney and Scottish N. E. Coasts.

The summer drift-net herring fishery was one of the poorest recorded for many years, landings particularly during the latter part of the season being far below the average at all ports. The sequence of events and phases were also similar to those of the previous year. The best results were obtained in June. A marked decline in the catches became apparent between July 11th and 18th and thereafter only individual catches of importance were recorded although all grounds within the effective range of steam drifters were explored.

During the early and most productive phase of the fishery the shoals consisted largely of immature fish and of adults with reproductive organs at stages which did not suggest spawning in the current season. Amongst the latter there were many fish which from the still incompletely recovered condition of the reproductive organs could be definitely classified as fish which had spawned in spring. The two age-classes with 4 and 6 winter rings respectively on their scales were relatively most important. The older group formed about one-third of the catches landed during June and the first half of July in season 1930 and it was one of the most important constituents amongst the spawners of the north-western area during the spring of 1931. It also contributed to the early summer shoals of 1931, particularly on the Orkney-Caithness grounds, although much reduced in numbers from the previous year. On the other hand individuals with five winter rings on their scales in season 1930, and with six winter rings in season 1931, made very small contributions to the autumn spawning shoals in the respective years. From an analysis of the age-composition alone one can therefore trace the dispersal of the spring spawning component of this group from the drift-net grounds and it becomes clear that both in 1930 and in 1931 the failure in the latter part of the summer drift-net fishing season is to be ascribed mainly to the withdrawal of non-autumn spawning fish, both adult and immature, from the drift-net grounds.

The herring caught on the Fladen Grounds in 1930 and in 1931 also show relatively high proportions of fish with 5 and 6 winter rings respectively on their scales. In age-composition they show closer affinities with the early summer shoals than with the autumn spawning shoals, and also in 1931, to individuals in the few samples of herring caught on drift-net grounds in August which had the gonads still at the lower stages of maturity.

The age-composition of the autumn spawning shoals show few outstanding features. The most important age-classes in the Caithness area had 2, 3, 4, 5 and 7 winter rings and on the Fraserburgh and Peterhead grounds 2, 3, 4, 7 and 8 rings. That so many age-classes have figured in the spawning shoals only serves to emphasise the numerical weakness of one and all of them. It is obvious from the results of the fishery that recruitment of the shoals in 1931 had been insufficient even to make good the decline from natural causes in the already sparse shoals of the previous year.

The latest recruits, with two winter rings, were brought into greater relative importance through the paucity of the other age-classes, but there is no evidence that the group — now a year older — will be sufficient to redeem the natural reduction of the stock unless further recruitment from outside sources takes place.

The only redeeming feature in the fishery for the near future was the abundance of fish with two and three winter rings respectively on the Northumbrian and Berwickshire coast. Catches for the greater part of the season were much better than at the more northerly fishing ports. Of a total of seven samples examined, six contained from 53 to 83 per cent. of two-ringers, and six contained 24 to 39 per cent. of fish with three winter rings. These two age-classes likewise contributed the greater part of the spawning shoals, dwarfing in numbers all the other age-classes to insignificance.

Haddock.

It has already been amply demonstrated that the most fruitful line of attack on the problems of the changes taking place in the haddock population of the North Sea plateau and of the interpretation of current conditions in the haddock fishery of the region is the tracing of the life-histories of the individual age-groups from the time they are added to the population till with increasing age and diminishing numbers they finally cease to make any appreciable contribution to the marketable catches. The routine work of determining the distribution, frequency of occurrence, and movements of the year-classes which has already been carried out for eleven years, was therefore continued.

During this period of intensive study of stock changes it has been observed that three broods or year-classes of exceptional numerical strength (those of the years 1920, 1923 and 1928) and five broods extremely weak in numbers (those of the years 1921 and 1922, 1927, and 1929 and 1930) were added to the population and that their respective influences were reflected later in the market catches. Frequent reference has been made to the depressing effect which the two poor year-classes occurring together in 1921 and 1922 had on the haddock fishery. One may therefore anticipate a similar result to accrue from the scanty additions made to the population by the successive broods of 1929 and 1930. The weakness of these two broods compared with that of the prolific brood of 1928 may be gauged from the following figures which give the percentage frequencies of the age-classes occurring in the total trawl catches made throughout the year.

Year-class	1930	1929	1928	Older Year-classes
Percentages.....	21.4	16.3	59.8	2.5

Thus in spite of the fact that the 1928 year-class has been subjected to considerable thinning in numbers by fishing operations (one year more than the 1929 year-class and two years more than the 1930 year-class) it was the predominant group in the demersal population and was in fact the mainstay of the fishery throughout the year 1931. Older year-classes were scarce and their contributions to the landings correspondingly meagre.

It will be recalled that the 1928 year-class in its period of adolescence was distributed in enormous numbers all along the western border of the North Sea from Muckle Flugga (Shetland) to the Northumbrian coast and that at the end of its second year it was also located in numbers on the north and west of Scotland. Along the western

border of the North Sea the 1928 year-class entered the market categories in the late summer of the second year of life and with increasing size continued to yield good catches from this region in 1930 and 1931. Its numbers, however, will suffer considerable reduction during the following spawning season when the ripe individuals concentrate on the spawning grounds and as both the succeeding broods are not sufficiently strong numerically to make good the losses there is likely to occur a sharp fall in the productivity of the fishery in the following summer and autumn.

Scanty though the broods of the years 1929 and 1930 have been their distribution during the period of adolescence when comparatively stationary showed significant differences. The 1929 brood although very weak in numbers was widely and somewhat uniformly distributed with a tendency to be more numerous in the vicinity of Viking Bank. A few of the more precocious individuals joined the spawning shoals in 1931 and it is presumed the whole of the brood will become spawners in 1932 although still of a relatively small average size. On the other hand the 1930 year-class was distributed much more sporadically although occurring with greatest frequency in the Shetland area. They are still of small size and only the most precocious of the group are likely to participate in the spawning of the ensuing season.

Towards the end of the year there was evidence of the beginning of the exodus of the 1928 year-class from the grounds south of Rattray Head. This departure of fish preparing for spawning was not only early but very complete, perhaps more complete than is normal for fish of this age from these waters. It will be important to note to what degree the 1928 year-class will re-populate the area south of Rattray Head, when, after spawning, their movements tend to be southwards and towards the shallower coastal banks.

During the early summer months the youngest year-class — or the progeny of the 1931 spawners — were still pelagic and consequently no occurrences in the small meshed section of the trawl catches were recorded. They were first observed in June when a few were caught off the Butt of Lewis and at Cape Wrath but small numbers were also secured later in the same month on the Fladen Ground. In July the average numbers in the catches had increased and representatives of the brood were caught in the northern deep water between Shetland and Norway as well as along the East Scottish coast from the outer limits of the Moray Firth to the Firth of Forth. In August they appeared in localised spots in relatively large numbers whilst in adjacent localities they were scantily represented. It is apparent from the data for this month that the whole of the brood had not then assumed the bottom habitat and that they were still feeding in the upper water layers with occasional excursions to the bottom. Dense patches were struck east of the Moray Firth and in the Buchan Deep. On the other hand they were practically unrepresented in the catches in the inner Moray Firth. In September conditions were somewhat similar to those encountered in August. The records show, however, that in the East Shetland area the average density had risen to 1,200 per ten hours' fishing. Large numbers were also caught off the Aberdeenshire coast and a phenomenally large number was obtained within the Firth of Forth as far west as Inchkeith. This latter record is somewhat unique as it is very unusual to find the Firth of Forth flooded

with 0-group haddock. In October the results also showed that large numbers of baby haddock were tenanting the north-western area of the North Sea (with the exception of the coastal zone) from East Shetland to the Firth of Forth and in December the observations reveal that considerable numbers were also assuming a bottom habitat off the Northumbrian coast and as far south as the north edge of the Dogger Bank.

Whether the 1931 brood also occurs plentifully on the north-eastern border of the North Sea cannot be determined from the observations carried out during the year since this area was only visited before the current year's brood had taken to the bottom. It should be noted here that on the June cruise undertaken by Sweden to the Skagerak and adjacent areas of the eastern North Sea haddock larvae were caught at all stations although not in great numbers. It is of interest to note, however, that a similar cruise in 1930 yielded no larvae.

The evidence at present available therefore suggests that the 1931 brood is very much more numerous in its first year than were either of the broods of the two previous years and that it is distributed in numbers in the north-western area from Muckle Flugga to the Northumbrian coast. It is a distribution which is reminiscent of the 1928 prolific brood in its first year.

While the early appearance of representatives of the brood in the bottom water layers, their widespread distribution and their occurrence in dense shoals in localised areas suggest favourable conditions for brood survival in 1931 it is still too early to assess fully the value of the current recruitment of the demersal population. The new brood, however, will have little appreciable influence on the market catches before the late summer of 1932 and even then will appear only as a flood of fish of small average size.

Plaice.

The problem of the rational exploitation of the stock of plaice of the Scottish coast is one of great urgency and hence a great deal of attention has been devoted by Scotland to tracing the changes occurring in the population within the territorial zone since the introduction and extension of more intensive methods of fishing by small motor-boats. Owing to the bathymetric conditions of the Scottish area and to the habits of the species the nursery grounds for the young growing plaice lie mainly within the territorial zone. There is no spawning in the inshore areas and the annual recruitment of the shallow strand region by the young bottom forms is dependent entirely on the dispersal and denatant drift of the pelagic eggs and larvae from the offshore spawning grounds.

Hitherto it has not been possible to investigate adequately the strength of the annual recruitment on the different nursery grounds. It is for the investigation of this aspect of the problem particularly that the motor-boat "Enid" has been employed and the location and sampling of the year-class 1931 (0-group) has been a prominent feature of the programmes of work. This age-group appeared in the catches about the middle of June and from that month onwards became a component of the catches in practically all localities sampled along the entire east coast and in all the bays from the Moray Firth

to the Firth of Forth. Its abundance varied greatly in different localities and even in successive hauls taken in the same depths in slightly different positions the results were sometimes very divergent suggesting greater "patchiness" in the distribution of the 0-group than of the older age-groups.

During the season a total of over 18,000 small plaice over a year old was caught and the following are the percentage age-compositions in several of the areas where repeated observations have been taken.

Plaice. Percentage Age-composition.

Year-class	1930	1929	1928	1927	1926 and earlier
St. Andrews Bay	3	48	8	40	1
Aberdeen Bay	71	22	4	3	..
Burghead Bay	38	43	15	5	1
Nairn Bay	55	33	10	2	..
Inverness Firth	21	48	14	11	6
Dornoch Firth	46	16	28	8	2

Whitefish seine net fishing by boats under 40 feet keel is permissible in St. Andrews Bay and Aberdeen Bay whereas plaice in the areas sampled in the Moray Firth are not liable to capture until they have moved outwith the three mile limit. The growing plaice during their first years of adolescence are comparatively stationary on that section of the coast where they first took to a bottom habitat. The I-group is also immune from capture by the whitefish seine net. There is therefore implicit in the above percentage table not only great variation in the recruitment of the stock on different sections of the coasts in the same year but also in the strength of the recruitment in the same area from year to year. Notwithstanding the intensity with which St. Andrews Bay has been fished the 1927 year-class still remains numerically strong. Additions to the stock by the 1928 year-class were very few, while the individuals born in 1929, the majority of which have not yet reached marketable size and have been subjected to intensive fishing only for a comparatively short period, are not much more numerous than the 1927 brood on which the thinning down in numbers by the fishing operations has been going on for two years longer. On the other hand Aberdeen Bay, Nairn Bay and Dornoch Firth received comparatively large contingents from the 1930 spawning shoals although the brood of that year reached St. Andrews Bay in extremely small numbers.

This inequality of recruitment of the different nursery grounds is probably due largely to the fact that although the plaice spawn outside the territorial zone the spawning grounds lie in comparatively shallow areas where there are frequent variations in the current systems which transport the pelagic eggs and larvae.

In all areas the growth rate has been exceptionally good during the year. Although the density of plaice in a limited area is probably a factor of very great importance the enhanced growth rate for the season appears to be due in great measure to the abundance of food and particularly to the appearance in all inshore areas of enormous numbers of post-larval sand eels on which the plaice fed copiously during the summer. Confirmation of this enhanced growth rate is also obtained from a comparison of the

results of marking experiments carried out in St. Andrews Bay on fish of similar sizes in March 1930 and 1931 respectively. The year 1930 was one of comparatively poor growth and the average increment of growth in length for fish of similar initial size in 1931 is almost three times that in 1930 for equivalent periods.

Hydrography and Plankton.

So far as the means at the disposal of the Committee would permit, the continuity of the hydrographical and plankton observations was maintained. The concentration of the investigations on the biology of the herring and haddock species, however, precluded the regular repetition of observations at "fixed" stations in linear arrangement but while no cruise, exclusively hydrographic, was undertaken the collection of temperature and salinity data at specified depths from surface to bottom formed an essential feature of the work carried out on all expeditions. The scope of the investigations may be ascertained from the itineraries of the different cruises.

The salinity determinations of the water samples collected by Scotland were made in all cases by the Government Chemist and the hydrographical data later transmitted in the prescribed form for publication in "Bulletin Hydrographique".

The investigative work upon surface currents, which has now been accomplished, although referring to pre-war years, establishes the case for its continuance. A third paper by Mr. J. B. Tait, dealing with the surface current systems in the region in the year 1911 has been published by the Fishery Board for Scotland[1]). It should again be emphasised, however, that the success of the work is dependent very largely upon (1) its intensity in each and every year and (2) its continuity in view of the number of variable factors.

The importance of a knowledge of the great water movements is obvious and hence during 1931 practically 2,000 surface floating bottles were despatched in groups of ten at most positions visited except those situated close inshore, in bays or estuaries. The plan of liberation adopted is proving extremely satisfactory. At the beginning of the year bottles were liberated outwith the North Sea west of Orkney and off the Butt of Lewis as far as the edge of the continental shelf. Then followed liberations some weeks later in the Faroe-Shetland Channel and to the north and north-east of Shetland. The next series was liberated round the periphery of the Great Northern Eddy System and in the north-western area of the North Sea. The next batch was sown in mid-summer over the Central North Sea and the last groups were liberated in November south of the Firth of Forth. Subsidiary liberations were effected in all areas to maintain continuity.

Almost 500 of these bottles have now been recovered, for the most part on the

[1]) J. B. Tait. The Surface Water Drift in the Northern and Middle Areas of the North Sea and in the Faroe-Shetland Channel. Fisheries, Scotland, Sci. Invest., 1931, No. III.

coast of Norway, but in fairly large numbers also upon the British coast. In lesser degree the western shores of Denmark and Sweden are represented, while several drifters have been picked up at sea. An unusual feature of the results of 1931 is that five bottles, so far, have been returned from the Dutch islands. In the course of a long series of similar experiments in the Northern North Sea this has happened but seldom and the circumstance doubtless has some underlying significance.

From the published results of earlier experiments with surface drift-bottles in the Northern North Sea and adjacent regions, it is possible, in many instances, to make a first estimate of the routes followed by the 1931 bottles, thereby pointing also to certain hydrographic phenomena relating to that year. For instance, both drift-bottle records and temperature and salinity data, the latter presently available for the first half of the year only, strongly suggest that, as has been found in respect of some but not all years, the North-Western part of the North Sea constituted what may be looked upon hydrographically as a self-contained area, bounded by an anticyclonic current system embracing practically the region east of Orkney and Shetland to the prime meridian. Water of high salinity denoting Atlantic origin was always to be found within this area particularly in the neighbourhood of Shetland. In the spring of the year the greater part of the Northern North Sea north of latitude 58° N. appears to have been filled with water of over 35 pro mille but subsequently the influence of fresh water, doubtless emanating from the Baltic, could be traced in the uppermost layers far westwards over the area in question.

As an illustration of the somewhat exceptional conditions which prevailed on the Scottish summer drift-net fishing grounds of the North Sea during season 1930 and 1931 there may be cited the invasions of enormous numbers of squid — *Ommatostrephes sagittatus* — a species exotic to the area. These squid were first observed in the drift-net catches in the Shetland area in summer 1930. Specimens cast on the beaches at several places were devoured by gulls. Their appearance on the drift-net grounds was almost synchronous with the sudden and complete break in the drift-net fishery. No indication of the presence of such large numbers of *Ommatostrephes* was obtained from the numerous trawling experiments of the Research Vessel or from information supplied by trawl skippers. Throughout the following winter the species was undetected but on the opening of the summer herring fishery they were again found in the drift-net catches in alarming numbers. From the evidence available in the drifter skippers' records it is clear that the main body of the squids had shifted south by 1931 and in July they were found infesting the upper water layers on all the principal drift-net herring fishing grounds as far south as Peterhead.

SOUTHERN NORTH SEA
1931.

By

W. Mielck.

Preliminary.

Again in the year under report (1931) the activity and co-operation in this area has been lively, and valuable progress has been attained. Seven research vessels have been at work in the Southern North Sea, some full time, some occasionally; moreover six other vessels, mostly patrol ships, have assisted in the work, making observations of their own or taking scientists on board. We are also indebted to many vessel owners, captains and fishermen as well as to administrative officials for the valuable help they have given us in all countries again this year.

As far as biological research is concerned, Herring and Plaice as well as Cod and Haddock have been in the foreground; of other food fishes that have been studied, Sprat and Sole deserve to be mentioned.

It was possible to undertake last summer two special tasks, concerning the Plaice and the Herring in accordance with resolutions agreed upon at the last meeting in March 1931.

For the Plaice the research vessels of the continental countries Denmark, Germany, Holland and Belgium have undertaken systemic observations on the age composition of the stock on the young fish grounds near the coast from Horns Reef to Haaks, on the Brown Bank and off the Belgian coast. By this arrangement the English research ship was left free for the marking experiments with plaice, planned on a large scale during this year, in order to study the growth-rate of this fish, the reduction of the stock by the fishery and the season and extent of their migrations towards the open Sea.

In the case of the Herring, it was possible to commence the study of a special question of interest to the commercial fishery, namely the question whether the composition of the trawl-caught and driftnet-caught herring is different, and if so, how.

Experiments with specially constructed saving trawls have not been repeated. The designs hitherto recommended have not proved to be very satisfactory. Many trials for comparison have, however, been made this year by German workers using ordinary trawls of different mesh in the codend and the Danish seine, on the lines of previous English experiments. These experiments have considerably increased our knowledge of the catching- and sparing-capacity of different gears, allowing a better judgment to be made of the effect of the fishery on the stock of fishes of different size- and age-groups.

Data as to the quantity of flatfish of the first and second years destroyed by shrimpers have been collected for the first time near the German coast and have proved a valuable supplement to the knowledge mentioned above.

That the prevalence of certain year classes in different food-fishes still decides the quality of the fishing has been demonstrated with a very satisfactory accord between the countries concerned.

The expectation advanced by the English investigators based on 1927 as a specially rich brood year for the Herring has been confirmed. Before the commencement of the East-Anglian season it was possible for the Lowestoft experts to issue a forecast which has proved to be reliable in all essential regards. The four year old fish bulked in the catch everywhere in the W. North Sea as well as in the Eastern part of the Channel. The production of the German Herring-fishery was much the largest for decades.

As regards the Plaice, all investigators agree about the dominance of the year-class 1928, the best since 1925. The brood of 1929 remained below normal, and the same was the case with 1930. In the yield of the fishery, however, the great number of the 1928 brood (III-group) has not yet fully become evident in the year under report. The results of the growth-rate investigations explain this fact, in showing that the growth of this year-class was retarded on account of its unusual density, and that consequently the majority of the fish had not yet reached the marketable size.

For the Haddock the Scottish investigators consider the quantity of the year-class 1931 above normal; and for the Cod the English results appear to afford a possibility of predicting the yield of medium-sized and large fishes.

The investigations on other useful marine animals, and on the Benthos, Plankton and Hydrography have also given interesting results, as shown on the following pages of this report.

The attempts to acquire a better knowledge of the distribution and migrations of larvae and young herring deserve special mention in view of the considerable gaps still existing about the biology of this fish and others. It may be expected that with increased co-operation and with the help of the hydrographers it will be possible more fully to understand the dependance on physical circumstances of the young of this important fish.

The valuable English hydrographical investigations in the Channel and in the Flemish Bight, continued since 1926 with great and varied means and methods, which showed in the previous year (1930) an increased inflow of water into the North Sea from November till January, show in this year the still less normal case of a continuous reversed current. In August the inflow into the North Sea was stopped and in September and October a real reversal of the current in the direction towards the western entrance of the Channel could be observed.

A. Work at Sea.

In Belgium the old "Oithona" has been taken out of service for demolition. At present there is no ship for research work except the fishery cruiser "Zinnia" — this for hydrography and plankton investigations. There is, however, some hope of soon obtaining a tugboat, even more suitable for the work than the "Oithona".

The research steamer "Dana" has not been available for investigations in the North Sea during the year 1931, and therefore the Danish research work has been restricted to the coastal waters. In the months of June and September fishing experiments were carried out from the "Japetus Steenstrup" with a fine meshed trawl (Eeltog) in the western part of the Limfjord.

The "George Bligh" was in continuous commission in the area from the latter part of March till the middle of December except during August. Fifteen voyages in all were carried out as follows: Four for experimental work on trawls, two for plaice marking, six for planktonic and hydrographical work in connection with the herring investigations and three for hydrography. Co-operation with a fishery patrol vessel was again secured on one of the hydrographical voyages. The "Onaway" was in continuous commission throughout the year and carried out work on the sampling of herring and sprat shoals, with drift nets, stow nets and seines. Work was also done on Plankton in connection with the herring investigations and on hydrography. The work at Sea of the English fish measurers, and the routine work of current measurements on lightvessels and surface sampling on steamship routes have been continued, thanks to the courtesy of Trinity House, and the owners, masters and officers of the vessels concerned.

The investigations of the marine laboratory of Boulogne s.m. were executed in collaboration with the "Station de la Mer du Nord et d'Islande" (patrol ships "Quentin Roosevelt" and "Estafette") and on some fishing vessels of Boulogne. The regular observations with assistance of the crew on board the lightship "Sandettie", lasted from the 1st of January until the 26th of June (Meteorology, Hydrography, Plankton near the surface and on the bottom).

In March besides hydrographical and plankton investigations on board the "Jean Bart", this ship was used for the study of the fishing grounds and growth rate of the bivalve *Pecten maximus*. In the same month "Quentin Roosevelt" made a cruise working hydrographical stations from Terschelling on to Skagen, and in May the "Estafette" made a hydrographical section, sampling plankton from Terschelling to North Foreland. In September—October the "Estafette" was on the herring grounds in order to watch the fishery and to make hydrographical and plankton observations.

From the 3rd—14th of May the research steamer "Poseidon" investigated the German Bight between Borkumreef and Hornsreef on the usual 6 sections (each with 6 stations) normal to the coastline; from the 13th—21st of October the inner part of the German Bight, off Amrum, Norderney and Borkum and a section from Borkum to the Southern edge of the Doggerbank ("Südriff" and "Hospital").

The main objects of both cruises were: 1) observation of the stock of plaice, sole and haddock with the addition this year of investigation of the distribution and quantities of young herring and sprat which are easily caught in the fine meshed covered codend now regularly in use. 2) Investigations with the bottom sampler, particularly in the valuation area off Norderney—Borkum in order to evaluate the stock of animals available as food for the fish there and also in the other parts of the area on the sections mentioned before. 3) Investigations on the brood of fishes and plankton, with tests concerning the catching capacity of plankton-nets of different design. 4) Hydrographic

investigations (in May including such on the content of nutritive substance). — A special task of the October cruise was the execution on the same spot of several series of parallel hauls with the trawl fitted either with the ordinary codend or the codend with the fine mesh covering, in order to study the difference in the catches of these two forms of the gear, and to use this knowledge in comparing former hauls with ordinary codend, with the more recent ones with covered codend (cf. below B I 6). Frequent cruises with the motorboat "Augusta" were utilized in the same way for the evaluation of the stock and for the comparison of hauls with the covered and uncovered trawl. Also the different codends used by the commercial motor-cutters, namely the fine meshed codend for the capture of soles, the large meshed for plaice and the Danish seine, were compared with oneanother and with the covered form.

The "Augusta" was also used in order to continue the investigations on the appearance of herring larvae near Heligoland and in the neighbouring estuaries and for the comparison of the catching capacity of different plankton nets.

Material has been collected by the Fisheries Laboratory in Hamburg, on a cruise with the fishery patrol boat "Frauenlob" from July 13th to August 16th for the comparison of trawl-caught and driftnet-caught herring, and on a motor-cutter during the first month of the year for studying the young herring of the S.E.-North Sea.

In accordance with the international agreement, the Dutch research ship "Nautilus" made two trips in order to investigate the stock of plaice on four sections running normal to the coastline between Ameland and Ijmuiden. The trawl used had a groundrope of 140 feet and a specially made codend with meshes of 6 cm. width. Moreover, beginning at the end of May, a six weeks cruise was undertaken into the N. North Sea in order to collect herring samples and make hauls with the trawl for acquiring data concerning the distribution of young haddock.

Besides hydrographical observations on Norwegian steamer-routes, no special work at sea in the Southern North Sea has been undertaken by Norway. Occasional investigations, however, falling within the purview of this Committee, have been carried out on sprat and on migrations of marked plaice.

On four separate occasions the Scottish Research Vessel "Explorer" made excursions into the Southern North Sea across the line Berwick-Lindesnaes, to extend the chain of observations carried out further north. On all four cruises trawling experiments were made with the fine mesh covering over the codend. In addition to the routine observations made on the trawl catches, serial hydrographic and plankton collections were obtained from selected positions. On all cruises surface drift bottles were liberated at the various observation positions.

The first cruise in the last half of March to the spring herring spawning grounds in the vicinity of the Firth of Forth included the area east of the Northumberland coast. In the first half of August observations were made at selected stations along a section extending from the Firth of Forth to the Great Fisher Bank. In the last half of September the conditions were again investigated in this area, the observations being extended to the north edge of the Dogger Bank. In November a series of inshore and offshore

stations were selected for the survey of the area lying between the Firth of Forth and the Norfolk coast. Continuous adverse weather conditions in November delayed and curtailed the programme considerably.

B. Fish.

I. General.

1. Statistics and Ichthyometrics.

In England the collection has proceeded without change of method. The numbers of the chief species measured are as follows:—

At sea.

Plaice	Cod	Haddock	Turbot	Brill	Soles	Total
152,033	12,847	57,906	729	507	8,537	232,559

On the Markets.

Plaice	Cod	Haddock	Herring	Total
58,734[1])	14,034	7,522	93,832	174,122

In France the measurements made at sea and on the markets by the laboratory at Boulogne have been continued in the same manner as heretofore, taking special regard of the species: Herring, Mackerel, Cod, Haddock, Whiting and the Gurnards.

The measurements taken at sea (offshore) by the Heligoland biologists are as follows:

Plaice	Other Fish	Total
86,271	27,247	113,518

The market measurements at Wesermünde dealt with 16,700 plaice taken by motor cutters in the S.E. North Sea. The figures for all market measurements from the North Sea including the Skagerrak are the following:

Plaice	Cod	Haddock	Other species	Total
16,709	1,634	4,425	5,342	28,110

2. Littoral Fishing.

At Ostend the investigations concerning the Belgian coast-fishery were continued as before regarding specially young flatfish and whiting, and with special attention to the changes resulting from the introduction of motors on all boats. Large quantities of waste, landed for fish meal and manure factories, have been examined. As usual each

[1]) Including 16,048 Plaice which were otolithed.

particular fish was measured and all invertebrates of the catch counted or weighed[1]). The destruction of young fish has increased enormously since the prohibition of landing fish under a minimal size, previously in force on the Belgian coast, was abolished in 1927. The quantity of invertebrates destroyed is also much greater. A number of boats go out to sea now, for the special purpose of gathering material for the factories, especially when marketable fish is scarce.

From his work on littoral fishing carried out since 1926 the Belgian investigator concludes, that the increased destruction of young fish and of fish food, (a matter injurious for the North Sea fishery at large) will cause, in the near future, still more direct harm to the important fishery for small but marketable fish, carried on within the 30 meter line by a great number of small fishermen, along the continental coast. Such a deplorable outcome is apprehended by the Belgian fishermen themselves, and they express their discontent freely about it.

The investigation on the new conditions of littoral fishing in Belgium, brought about by the general adoption of motors, must still continue for a number of years, in order to avoid deception caused by seasonal variations, fluctuations etc. Local variations due to the gregarious habits of young fishes are also deceptive. For instance two hauls

[1]) To give, by an example, a general presentation Prof. Gilson sent the following figures from an average haul made by one of the numerous Belgian motor cutters:—

Fishes	Marketable size		Undersized	
	cm	number	cm	number
Dab	23—30	98	6—18	4570
Sole	18—36	56	4—11	219
Plaice	20—40	5	6—18	446
Flounder	19—32	4	..	..
Brill	26—30	2	..	..
Whiting	..	..	9—18	3672
Trigla hir	..	..	8—15	245
Herring	..	..	10—15	19
Sprat	..	..	8—12	66
Raja clav	..	..	8—17 (br.)	28
Total...		165		9265

Invertebrates	kg
Portunus hols	105
Eupagurus bernh.	37
Crangon vulg.	36
Asterias rub.	21
Aphrodite ac.	9
Ophioglypha	6
Flustra fol.	2
Alcyonidium gel.	1
Total...	217

Besides: 4 Sepia off., 8 Loligo sub., 4 Sepiola atl.

The Common Dab is always dominant.

Unmarketable species of fish:

	cm	number
Trachinus vip.	7—16	737
Arnoglossus lat.	6—15	228
Agonus cataphr.	6—14	251
Solea lutea	5—12	139
Total...		1355

Small fish (unmarketable) total ... 10620 = 233 kg.

Total weight of the part of the catch considered as waste = 450 kg.

made on the same place at an interval of 2 days showed a variation in the number of soles of 3 to 9 cm., from none at all up to 900 specimens.

For Belgian work on herring and sprat see III,1 and V.

In the East Anglian area work has been carried out on young herring and sprat. For the 1930 crab marking experiments the returns are being worked up. Investigations on a special problem with regard to the periwinkle are being made in the River Blackwater.

In the coastal area of France the observations were centred on the young of herring; sprat and cod occurred here in great quantities.

The biological laboratory at Hamburg started a methodical investigation of the young herring of the second and third year in the mouth of the river Elbe, which form the object of a winter fishery on the part of the German motor-cutters.

The data collected by the "Biologische Anstalt Helgoland" during the years 1926 to 1930 on the distribution and frequency of young flatfish on inshore grounds and in the Waddensea could not be completed for want of an assistant. There is, however, a publication to be expected on the observations of the quantities of flatfish contained in the additional catches of the shrimpers which are utilized for the production of fish meal; these observations were made in 1929—30 on behalf of the Prussian government. By analysing 416 samples collected during the whole year on all fishing grounds along the coast with a total weight of about 100 cwts. of small flatfish it could be calculated that in the course of the named year the following quantities of young flatfish (0-, I- and II-group) in millions of individuals had been caught: 63 millions of plaice, 25 dab, $5^1/_2$ flounders and $3^1/_2$ soles. However limited the value of these figures derived from a single year may be, they give nevertheless an idea of the reduction of the stock by the fishery during the first years of life, which must be considered of practical value as such data concerning these fishes have not been available before.

3. Eggs and Larvae.

During the cruises of "Poseidon", "Augusta" and "Explorer" the observations on distribution and quantity of pelagic fish fry have been continued, especially regarding Herring-larvae (cf. chapter III. Herring).

4. Food of Fishes.

In Lowestoft the work on the food of the herring has been continued. (See B. III. 7).

At Boulogne notes have been taken as usual, concerning the stomach-contents of Herring, Mackerel, Whiting, Cod, Gurnard and other species.

The quantitative statements on the food of flatfish, especially plaice, and of Gadoids made by the German investigators in the valuation area off Norderney—Borkum and in other localities will be published in 1932. The investigation of the chemical composition of invertebrate bottom animals in order to get an estimate of their value as food have been continued.

5. Marking Experiments.

The Lowestoft Laboratory has carried out large scale plaice marking experiments according to the regulation agreed between the representatives of the countries concerned in Copenhagen last year. (See B IV 7).

6. Experiments on the catching Power and sparing Quality of Fishing Gear.

The experiments carried out by English collaborators procured further data on the size released by large meshed codends. The method used was to take alternate hauls with a normal commercial codend and one with meshes of a larger size, — both being used without a "cover". — It has been definitely proved that, contrary to a frequently expressed opinion, the majority of fish that escape through the meshes of the codend do so when the trawl is being towed and not after the way is off the ship and the net is being hauled. A report on the English experiments is being prepared. — Further reports are being made for this Committee on the commercial meshes used in the Southern North Sea, and on the information on saving gear available to date. (See Report of Southern North Sea Committee 1931, proceedings 3 and 4; Rapp. & Proc.-Verb. LXXIV, p. 58—59.)

The Heligoland Laboratory made a series of trials in order to study the selective action of the common trawl with a North Sea-codend, the cutter-trawl with a codend for plaice and with a codend for sole, and the Danish seine, and in order to compare the catch of these implements with the catch of "covered codends". During these experiments, which were principally concerned with the plaice, 40,500 plaice and 12,500 other fishes were measured on board the "Poseidon" and "Augusta". From these comparisons it was obvious that the catch in the common codend by no means showed the same composition, if the gear was used with and without the fine mesh covering. Therefore we cannot compare the results arrived at in former years with the uncovered codend with the more recent ones, in which the covering was used. By a series of parallel hauls with and without the cover made with the trawl of the "Poseidon" as well as that of the "Augusta" we have now got some notion of the divergence, so that this can be taken account of in the calculation. Nevertheless further information is wanted.

On the efficiency of nets with varying width of the meshes in the haddock fishery, as stated by British investigations, principally, the German Government received a report in compliance with a recommendation of the Consultative Committee in 1930 (cf. Rapp. & Proc.-Verb. LXVI, 1930; Subcommittee on North Sea Problems, p. 30—31, Nr. VI).

7. Methods (cf. also above under 6).

Arrangements were made by the Lowestoft Laboratory to carry out, in the early months of 1932, experiments as to the method of catching herring larvae. The Heligoland Laboratory made some experiments with the same aim in October 1931 near the S.W. edge of the Dogger Bank.

A contribution to the "Handbuch der biologischen Arbeitsmethoden" edited by Abderhalden has been completed with the title: H. Hertling, "Die Züchtung von Meeresfischen für wissenschaftliche und praktische Zwecke".

II. Cod and Haddock.

On the results of the English cod investigations a paper by M. Graham, entitled "Report on the North Sea Cod", is being prepared for the press and will be published shortly. The author summarises the data on the growth-rate of the cod; there are two main growth-rates in the North Sea, a fast and a slow. The writer then examines changes in the stock of cod in the North Sea basing his results chiefly on the Grimsby statistics, and has prepared a formula for forecasting the yield of medium and large cod. He concludes that the stock of cod in the North Sea is in no apparent danger of further diminution. — The English haddock measurements have been placed at the disposal of the Fishery Board for Scotland.

In a similar way the haddock measurements and the scale material of the May cruise of the "Poseidon" between Borkumreef and Hornsreef and the 40 meter depth line have been sent to the Aberdeen laboratory. The haddock population in the German Bight was much lower than in 1930.

Dutch investigations on the distribution of young haddock were made towards the end of May and in June in the N.-North Sea by the "Nautilus". In December large catches of haddock were experienced unexpectedly N.W. of the West Frisian islands by Dutch fishermen; it was, however, impossible to get material for the examination, as the successful fishing lasted only quite a short time.

The main object of the Scottish trawling observations within the southern area was to extend our knowledge of the frequency of occurrence of haddock of the different age-classes in the more southerly limits of their distribution. All haddocks caught were measured and copious scale samples secured for age-assessment. Small samples of haddock scale material collected by the German Research vessel "Poseidon" in May in the German Bight are also available. The scale data are being used as an aid to the analysis of the haddock data collected by the Ministry of Fisheries (England). The trawl catches yielded extremely poor numbers for all age-classes. As indicated in earlier reports the year-class 1928 was exceptionally successful, but in the first year of life it was distributed in greatest density along the Scottish East Coast and in the regions to the north and west, relatively few of the brood tenanting the shallow grounds to the south and east. The latter area has since suffered diminution in the numbers of this brood not only by fishing operations but by northerly movement of the mature fish at the time of spawning migration. This successful year-class, however, was still contributing over 30 per cent. by numbers to the catches in the area in the autumn months. On the other hand the 1930 and 1929 year-classes contributed 30 and 35 per cent. respectively, the greater numbers of the 1929 year-class being due to its relatively greater frequency in the Eastern section of the area.

There was already evidence in the Northern area as early as June that year-class 1931 is likely to prove much more successful than either of the two preceding broods and by the month of August small numbers of these were being obtained in the bottom water layers south of the Firth of Forth. While these numbers had increased greatly by September and November, the observations are still too few and too early to assess accurately the strength of the new recruits in the Southern limits of their range.

III. Herring.

1. Statistics. Analyses of Herring catches; Year-class Composition. Forecasts.

In Ostende a special study of spent herring has been actively carried on since 1930. Shoals of this herring which accumulate every winter in the littoral band between Cape Gris Nez and the Schelde form the basis of an important fishery carried out principally by small motor boats. The 1930—31 season has been very successful, as shown in the publication mentioned below[1]). Unfortunately, the season 1931—32, on the contrary, was a complete failure, caused by the economic conditions prevailing, prices remaining very low. After a few weeks the fishermen gave up both herring and sprat fishing altogether. The result was that the research work was also seriously affected. However, the investigations have been carried on, as far as possible, on the same lines as last year, for evaluation and with a view to detecting possible variations in the behaviour of the shoal of spent herring that remains some time near the coast after spawning. A second paper is in preparation.

The usual investigations on the East Anglian herrings have again been carried out. During the period October—December, 32 samples of fish have been examined at the Lowestoft Laboratory for age, length and maturity, and these samples have been supplemented by the measurement of many thousands of fish at both Yarmouth and Lowestoft. These measurements, which were representative of the complete landings by the commercial boats, enabled us to arrive at the approximate age-composition of the shoals in the East Anglian area.

In August 1931, an article was published in the "Fishing News" giving the prospects for the East Anglian fishery in the autumn of the same year, and also the expected age-composition of the shoals. The work of the past season has shown that the estimation given was reasonably accurate, the only difference — and that a slight one — being in the number of four year old fish. There were slightly more fish of this age in the fishery than had been expected by calculation. By continuing this method of investigation for a number of years, it is hoped to produce much more accurate ideas on the rates of mortality. The main year-classes in the shoals this season have been those of 1924 and 1927, i.e. the seven and four year old fish, and the two classes 1921 and 1922 which were responsible for good catches in the past, were present in small proportions.

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[1]) G. Gilson. Recherches sur la Biologie du Hareng "Guai" et sur sa Pêcherie entre Ostende et le Cap Gris-Nez en 1930—1931. Annales de l'Institut d'Etudes Maritimes d'Ostende. Mémoire 1. 1931.

The work in the Boulogne Laboratory was specially concerned with the herring populations of the S.W.-North Sea and the Eastern part of the Channel. The age-distribution of the herring population of the eastern Channel was found during the fishery season 1931—32 to be as follows:—

Age Group	3	4	5	6	7	8	9	10	11	12
Year-class	1928	1927	1926	1925	1924	1923	1922	1921	1920	1919
%	4.5	41.2	21.5	12.5	10.6	5.6	3.2	0.5	0.2	0.1

The favourable influence of the good survival year of 1924 may be traced up to 1931, the percentage number of 7 years old herrings being relatively high. The influence of the year-class 1922, which was equally rich, has practically come to an end. On the other hand the year-class 1927 which proved to be a rich one as early as 1930, may be traced again by the abundance of 4 years old herrings in the spawning shoals of the eastern Channel in 1931. The year-class 1926 continues to be represented by numbers very near to, though slightly below, the normal.

Of bad survival years, 1923 and 1925 again stand out in the above age-distribution, their relative frequency remaining well below the normal. — In contrast to what might be expected, the year-class 1928, which appears for the first time in the shoals, had a frequency inferior to the average of the last few years for 3-year old fish.

In the Fisheries Laboratory at Hamburg the statistics of the German herring fishery, trawl caught as well as drift net caught, have been elaborated as in former years and detailed reports have been published[1]). Moreover the study of the German driftnet fishing has been continued on the basis of a large number of logbooks placed at the Laboratory's disposal by the skippers of the drifters; the data from these books for 1930 have been plotted on charts and these have been published as heretofore. At the beginning of 1932 it was possible to collect and publish also the statistics of the German herring fishing during 1931[2]) and to state that the takings last year amounted to 416,437 kantjes (i.e. sea packed barrels) of cured herring and 73 million kgs. trawled fresh herring, — quantities unprecedented in the last decades of the German herring fishing.

The herring shoals which form the basis of the German fishery in the Western North Sea have been analysed as in former years, but the methods had to be extended to a certain degree according to the proposals adopted by the Lowestoft meeting of herring experts in the beginning of November 1930 (Rapp. Proc.-Verb. LXXIV, p. 116).

The more exact distinction and denomination of the various stages of sexual development (point 3 of the agenda) has to be considered as a very important means for judging the composition of herring shoals occurring on different fishing grounds and for the separation of the constituent elements. This, must be regarded as an essential,

[1]) H. Lissner. Der deutsche Trawlheringsfang 1930. — Der Fischerbote 1931.
H. Lissner. Die deutsche Heringsfischerei mit Treibnetzen i. J. 1930. — Berichte der DWK, N. F. VI, 1.

[2]) H. Lissner. Ein neues Rekordjahr des deutschen Heringsfanges. — Der Fischerbote 1932, p. 25.

task as we recognise more and more the fact that all herring catches are mixed up and usually consist of fishes of rather different origin (Comp. 6. Herring Races).

For all herring samples investigated by the German collaborators age-determinations have been carried out to the same extent as in former years. They showed a strong prevalence of 4 years old herrings, that is to say of the year-class 1927. The year-class 1926 was not so numerous as might have been expected from the quantities stated in 1930. The Fladen ground retained a considerable stock of the year-classes 1922 and 1923.

In Holland seven samples of herring (1600 individuals in all) which were landed from October till December at Jjmuiden by English drifters were examined for age and l_1. For the collecting of statistical data concerning the herring season through the agency of the Union of drifter owners at Vlaardingen, several hundred logbooks were distributed among the skippers. Up to the end of the year only about 30 of these books had been returned. The intention is to plot on a chart divided in squares of 10′ geographical latitude and 20′ geogr. longitude the average number of tests and catches made, after the method used in the Hamburg Laboratory.

2. Comparison between driftnet-caught and trawled Herring.

In connection with the programme laid down at the above mentioned special meeting of Herring experts and especially with the problem of finding out whether the trawled herrings and the drift herrings are similar or not -- No. 9 of the Protocol, l. c. p. 118 —, an investigation was carried out by the English at Grimsby, in September, on the herrings of the area. The length, sex and maturity of the four year old fish were taken, and the vertebrae of these fish were counted. The length of the first growth zone on the scales is also being calculated. The results will be ready shortly for the intended comparison with the results of the examination made by the Germans.

On the German side, however, only sparse material could be provided for this purpose. Arrangements had been made for two collaborators of the Hamburg Institute to embark on a Fishery survey boat visiting the German herring fleet on the Fladen Ground in July—August and on the Dogger Bank in October. The investigators stayed on board the "Frauenlob" in July—August, but unfortunately found only rather limited opportunity to collect the material required, as the drifters did not occupy the grounds N. and N.W. from the working places of the herring trawlers on the Fladen. However interesting the material from drifters working off the Firth of Forth proved to be, the samples acquired are not sufficient for the comparison of herrings caught on the same grounds with different gear. The second cruise contemplated could not be carried into effect. The collecting of material is kept in view for another opportunity.

3. Fishing Experiments.

At North Shields, in the early summer, experiments were carried out with a fleet of mixed drift nets on the small fish which were present in that area at that time, and concurrently with these experiments, some valuable observations were made on the use of the Hardy plankton indicator.

4. Young Herring.

A cruise with the "Onaway" took place in April 1931, when a comprehensive programme was worked in the Wash. Many of the banks and streams were fished with the seine, and good catches of young herrings were taken. The length of the fish suggested that they were derived from an autumn or late summer spawning, which is in accordance with former observations in this area.

The study of the shoals of young herring in the mouth of the Elbe and in the neighbouring parts of the German Bight was undertaken and extended to general statistics of the fishery as well as statements of length, weight, age and number of vertebrae, in order to ascertain the origin of these shoals with a chance possibly of surveying the fluctuations in the stock of North Sea herring in earlier age-groups than heretofore. — The material was completed by samples caught offshore in the German Bight by the Heligoland Laboratory during the May cruise of the "Poseidon".

In these experiments the covered codend retained the young herrings of the I- and partly also the II-group (as well as the sprats) in quantities, off the North Frisian coast between Horns Reef and the river Elbe, i.e. in the residual current of water of low salinity which is dependent on the outflow from the estuaries of the rivers Elbe and Weser and can be followed generally in a northerly and later northwesterly direction. Off the East Frisian islands of Norderney and Borkum and N. of these down to the 40 m. depth line, i.e. in the area little or not influenced by coastal water, these Clupeoids did not occur or in small numbers only. This movement of the young fish towards N. and N.W. is consistent with former occasional observations, whilst a migration towards W. or S.W. has not been noted formerly. A similar distribution is shown by the populations of older herring larvae if we judge from the catches with Petersen's young fish trawl. At the same time the appearance of *Phaeocystis globosa* was observed. There was an abundant growth of the alga everywhere off the East Frisian coast and in a more northerly direction, whilst it was rare or wanting off the North Frisian coast, so that the area of its occurrence was to a considerable degree free from herring (cf. chapter D).

5. Location of spawning Places and larval Herring.

Sampling of haddock stomachs has been carried out by Denmark in the Jutland Bank Area, in order to investigate the location of the spawning places and the intensity of spawning of the autumn herring of the North Sea in these areas. While the results of this task have not yet been worked out, a report is in print[1]) on the distribution of herring larvae caught by the "Dana" during her cruises in the North Sea, mainly in September—October 1930.

Near Heligoland and in the estuaries of the Jade—Weser—Elbe the observations on the appearance of larvae during the period December till May were continued and their occurrence further off in the open sea investigated in May and October by the "Posei-

[1]) E. M. Poulsen. On the spawning places of the herring in certain parts of the North Sea, the Skagerrak and the Kattegat in the Autumn of 1930 and some earlier years. — Medd. Komm. Danmarks Fisk. og Havunders. Ser. Fiskeri IX, 4. 1932.

don". The nature of distribution in May has been mentioned in the previous chapter already; it may be added, that besides the older larvae, belonging to the autumn-brood from the Dogger and winter brood from the Channel, young spring larvae were caught as in former years only off the entrance to the Lister deep (length 8—9 mm. on the 5th of May). In October herring larvae were absent from the German Bight, as expected. Between Borkum and the Southern edge of the Dogger Bank they have not been observed further to the East than 54°19′ N. 3°36′ E. and in greater quantities not beyond 54°17′ N. 3°0′ E. (Eastern edge of Southreef, S. of "Hospital"). Here the number below 1 sqm. of surface was 188 individuals (7—18 mm. long; one more numerous group with a mean length of 9.5 and one less numerous of 13 mm.). The larvae appearing for the first time about Newyear near Heligoland, measuring mainly 30 to 35 mm., probably belong to this population.

On the cruises with the "Explorer" the following distribution has been found: While an abundance of the spring brood larvae, many in the yolk sac stage, was found in the Firth of Forth spawning area, especially in the neighbourhood of Fife Ness, no spring brood larvae were found in the last days of March off the Northumberland coast.

No herring larvae were caught offshore in the area between the Firth of Forth and the Great Fisher and Dogger Banks either in the first half of August or in the last half of September.

The area under investigation in November extended Southward of the Firth of Forth as far as the Norfolk coast and Eastward to include the Dogger Bank. While herring larvae were caught at all positions examined the numbers in the catches were few, though relatively more frequent at the positions immediately South of the Forth than at those on the Dogger Bank. As in all previous observations on unscaled forms in this month the smaller sizes predominated and few were taken larger than 20 mm. in length. Hatching in the Northern section was obviously finished but it was still proceeding in the South, where newly hatched larvae were taken in the neighbourhood of Cromer Knoll. The percentage of larger larvae was higher in the North than in the South though neither region gave evidence of any considerable influx of these forms. On the other hand the larger larvae were more numerous and of larger size in the Firth of Forth area.

6. Herring Races.

The only work under this head, on the English side, was that done at Grimsby, which has already been mentioned under III, 2.

The French investigators found the average number of vertebrae of Le Gall's Group II (between the mouth of the Somme and Cap Antifer) to be equally constant during the season of 1931 as in the preceding years at a value of

$$A = 56.77 \pm 0.10.$$

North of the Somme, i.e. herrings of the Group I, the average number of vertebrae was, in 1931, very much the same as that of the Group II, to wit

$$A = 56.783 \pm 0.15.$$

The average number of vertebrae of the Dyck-Sandettie herrings during the same period was

$$A = 56.65 \pm 0.09.$$

From this we may infer the following:

During the season 1931—32 the herring population of the eastern Channel (Group I and Group II) was chiefly — if not totally — composed of herrings of the Channel type (average of vertebrae about 56.75). There was, as it were, no invasion at all of herrings of the Southern North Sea type into the Channel. This is a scientific verification of a practical experience made by the fishermen in the course of the past herring season. On the other hand, a strong invasion of herrings of the Channel type into the North Sea has taken place. This is demonstrated by the high average of vertebrae observed in the Dyck and Sandettie regions (and most likely also in the south western part of the North Sea by other investigators). The southern type of the North Sea herring could be found without admixture only in the south eastern part, near the Belgian coast, off Ruytingen.

The racial investigations undertaken by Schnakenbeck were essentially intended to afford reliable assistance in the discrimination of different components in the herring shoals of the North Sea. The results of these investigations[1]) have not found general approval. They have, however, been continued in the Hamburg Institute, the workers being still convinced of the usefulness and reliability of such studies. Nevertheless it appeared promising to make certain alterations and amendments in the application of the procedure and these were found e.g. in using a more exact and improved method of determining the stage of sexual development in order to decide on the spring or autumn spawning character of the specimens in question. This was accomplished by determining for each single herring of a sample the proportion of the weight of the gonad to the total weight of the body, stage V of sexual maturity being given, if the weight of the gonad is at least equal to 15 % of the total weight whilst a weight of the gonad of 10 to 15 % of the total weight announces stage IV. In this way Lissner effected quite a good separation of the different stages of maturity, the distinction of which has always met with great difficulties. By this expedient the investigator was able to separate in a more reliable way the different forms of herrings composing the shoals in the Western North Sea, and in applying this method to the analysis of all the samples investigated it appears possible to arrive at a more satisfying and complete characterisation of the composing racial elements, and so much the more as the number of samples from trawl-caught and driftnet-caught herrings from different fishing grounds could be largely increased and brought up to 35 samples of adult herring with about 6000 specimens during 1931. — As the principal means for the fixation of the racial character of fishes with equal maturity, considered as homogeneous, the counting of vertebrae was carried

[1]) W. Schnakenbeck. Zum Rassenproblem bei den Fischen. — Journ. du Cons., VI. 1. 1931.
W. Schnakenbeck. Zum Rassenproblem bei den Fischen. — Zeitschr. f. wiss. Biologie, Abt. A, Bd. 21. 1931.

out as in previous years, and it was interesting to state that the frequency curves of these counts showed curves differing in a certain way from those given by Schnakenbeck in using material of the same origin. Though the statement of this author as to the mixture of the herring shoals in the N.W.-North Sea is supported, it appears that the spring spawning shoals play a remarkably great — though always varying — part in the composition of the stock in the North, as supposed already by the Scottish investigators (Bowman and Wood). In a similar way the herring population of the Dogger region may be split up into autumn spawners of the same character as those further North and winter spawners which ought to be identified with the so-called Channel herring.

Further investigations will have to show how far the peculiarities of the young herring occurring in the Southern North Sea and the German Bight allow us to identify their racial characters with those of the adult forms in the Western North Sea.

The racial investigations with adult herrings planned by Holland had to be postponed, as these fish, which in other years have mostly appeared in the southerly Dutch inshore waters during the first months of the year, were missed this year.

7. Food of Herring.

The stomachs of 5,191 herring were collected by the Lowestoft Laboratory from the feeding ground off Shields during the period 23rd April to 8th September. These were supplemented by material from liners working on the Viking and Great Fisher Banks; 1,272 stomachs were obtained from the liners between the 26th April and the 3rd August. A report[1]) has been published on the material collected during 1926.

The stomach and gut contents of herrings collected on a former occasion on board were analysed in the Hamburg laboratory and gave some interesting results concerning the hours of day and night at which the herring prefers to feed[2]).

IV. Plaice.

1. Statistics and Ichthyometrics.

The work of measuring plaice at sea has been discontinued from the port of Lowestoft and has been reduced from Grimsby. Measurements on the market, of the plaice landed have been increased at both these ports.

To complete the observations on board by the Heligoland Laboratory the statistical and biological work at the fishmarket of Wesermünde was continued and occasionally extended by measurings taken at Cuxhaven and Hamburg-Altona. The

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[1]) R. E. Savage. The Relation between the Feeding of the Herring off the East Coast of England and the Plankton of the Surrounding Waters. — Fish. Invest. Series II, Vol. XII, No. 3, 1931.

[2]) Sl. Mužinić. Der Rhythmus der Nahrungsaufnahme beim Hering. — Ber. d. Deutsch. Wiss. Komm., N. F. VI, 1.

results of these market investigations, pertaining to catches of motor-cutters mainly, and of those executed on board in the German Bight during 1929—31 will be published in the course of 1932.

The amount of plaice measurements done in England and Germany may be gathered from chapter B I, 1.

2. Age-determinations; Quantity of the Year-classes.

By the Ostend Laboratory only a few hauls with the experimental shrimp net had been made to ascertain the distribution of year-classes from the shore seawards, when the "Oithona" was taken out of service. The plaice from each haul were measured and otolithed.

The plaice caught in the Danish fishing experiments in the Western part of the Limfjord (Nissum Broad) were subjected to measurements and age-determinations. The number of individuals of the different year-classes caught per 30 minutes were as follows:

Year-class	1931	1930	1929	1928	1927	1926
Age-group	0	I	II	III	IV	V
No. of specimens.... June	..	82	148	694	38	2
Caught per 30 min... Sept. ...	2	119	96	269	5	2

It appears that the 1928 year-class — in accordance with previous investigations — was a rich one; the 1929 and 1930 year-classes are below normal. — Age analyses of samples of undersized plaice caught with the Danish seine on the Southern Horns Reef grounds (10—20 m.) in the month of April 1931 for transplantation to the inner Danish Waters were carried out. The average size of the various year-classes was as follows:

Year-class	1929	1928	1927	1926	1925
Age-group	II	III	IV	V	VI
Average length, cm.	14.7	18.9	22.3	23.9	24.8
No. of specimens investigated	43	608	1263	113	35

The mean lengths found here are much the same as those found in the corresponding age-groups in catches made with the 50 feet Otter-trawl in April 1927 and by the Danish seine in April 1928, 1929 and 1930, but somewhat higher than those found by the fishing experiments in April 1925.

If we compare the percentage of the different age-groups of plaice caught on the named grounds with Danish seine for transplantation in April in the years 1928—1931 we get the following picture (year-class stated in brackets):

Age-group:	II	III	IV	V	VI	VII	Total number
1928	4.3 (1926)	**34.2** (1925)	20.7 (1924)	16.9 (1923)	23.0 (1922)	0.9 (1921)	439
1929	3.5 (1927)	13.1 (1926)	**81.3** (1925)	1.6 (1924)	0.3 (1923)	0.1 (1922)	867
1930	..	11.4 (1927)	33.3 (1926)	**51.4** (1925)	1.9 (1924)	1.0 (1923)	105
1931	2.1 (1929)	29.0 (1928)	61.3 (1927)	5.5 (1926)	1.7 (1925)	..	2062

It is evident that in the years 1928, 1929, 1930 the rich year-class 1925 was predominating in the catches. But in 1931 its rôle is finished and it is now the year-class 1927 — the frequency of which according to Aage J. C. Jensen[1]) must be regarded as average — that constitutes the largest part of the plaice caught. The rich year-class 1928 is the one next to it; that it does not play a still larger rôle is no doubt due to the fact that, on account of its large density, it has had a rather poor growth and thus not yet fully reached the length by which it is caught in the gears used.

In accordance with the agreement reached last year at the Meeting of the International Council, cruises of the "George Bligh" to obtain plaice for age investigation have been discontinued. In the course of the marking experiments in May and October, however, samples of approximately 500 otoliths were obtained at each of the 6 positions, where plaice were marked.

The collection of otoliths of each trade category of plaice was continued at Lowestoft and was also carried out at Grimsby. The following numbers of fish were measured, weighed and otolithed:

Lowestoft:

1931	Dead Small	Small	Best Small	Small Medium	Best Medium	Large & Best	Total
April	358	620	362	373	140	143	1,996
July	353	591	347	166	64	126	1,647
October	309	503	298	311	176	106	1,703
December	256	470	250	286	150	90	1,502
Total...	1,276	2,184	1,257	1,136	530	465	**6,848**

Grimsby:

1931	Chats	Small	Best Small	Middles	Best Medium	Large Best	Large	Total
March	453	359	613	289	286	166	101	2,267
June	760	546	439	328	193	136	93	2,495
September	540	492	450	313	182	132	93	2,202
December	590	600	337	290	194	135	90	2,236
Total...	2,343	1,997	1,839	1,220	855	569	377	**9,200**

The material obtained in October and December has not yet been fully worked up, but for the earlier periods it has been completed and related to the catch per 100 hours' fishing of each port.

At both ports the 1927 year-class showed the highest percentage by number of the total landings with one exception, that of the July landings at Lowestoft when the 1928 year-class (III-group) was the most numerous. At Grimsby the 1926, 1927 and 1928 year-classes (III to V age-groups) account for over 64 % of the landings by number and over 42 % by weight, in March, June and September. At Lowestoft the same age-

[1]) Aage J. C. Jensen. Investigations of the Plaice in the Southern Horns Reef Area in the Year 1928—1930. — Medd. f. Danmarks Fiskeri- og Havundersøgelser, Ser. Fiskeri, IX, 2. 1931.

groups made up over 84 % by number and over 76 % by weight of the landings in April and July. The total landings per 100 hours' fishing at Lowestoft (cwts.) were lower in April, 1931, than in April, 1930, but were higher in July and October, 1931, than in the same months in the previous year. The II-group (1929 year-class) was not taken at all in April at Lowestoft, and in very small numbers in the other two months; at Grimsby also very few of this year-class were landed. This confirms the view, expressed in the Report of last year, that this year-class would probably prove to be poor.

The Heligoland Laboratory was able to continue in the usual way the evaluation of the age-composition of the stock in the S. North Sea and extend it to the youngest year-classes (I- and II-group), as far as these occur outside the Waddensea, by the use of the covered codends. In regard to market plaice these controls were largely extended at Wesermünde, Hamburg—Altona and Cuxhaven. The work done at sea on these occasions (May and October with "Poseidon", in the other months with "Augusta") is given by the following figures:

Month	Region	Number of otoliths read
February, March	Heversection	1,370
April	Otzumer Balje	1,472
May	6 sections between Borkum and Hornsreef	12,269
July	Heligoland	3,870
September	Heligoland	2,539
Sept., October	Amrum, Heligoland, Norderney, Borkum	2,227
	together...	23,747
	add market plaice from motor-cutters	16,500
	total...	40,247

The year-class 1928 proved (in conformity with earlier investigations) to be very rich; year-class 1929 stands below the average. The same seems to be true for the year-class 1930, though the comparison with former investigations was curtailed by the changing of the gear (covered codend). In the catches of the German motor-cutters the IV-group prevailed as in the previous year; beside this the III- and V-group were mainly represented in the landings. Under the growth conditions prevailing at present the IV-group seems to be the most important for the motor-cutters, even though it is represented by a poor year-class (cf. 1926 in the landings of 1930).

During the Dutch serial collections between Ameland and Ijmuiden ("Nautilus" in May) 7,000 plaice were measured and 3,300 otolithed. Here also the III-group (year-class 1928) appeared to be the richest.

3. Rate of Growth.

This is being studied in England by means of marking experiments on a large scale. The results obtained from the 1929, 1930 and 1931 experiments will be reported on later in the year.

In the Danish and German investigations the mean length of the age-groups was used as heretofore in order to characterize the growth rate. As mentioned above (§ 2)

the mean lengths of all age-groups (II—VI) investigated by the Danes in April 1931 from seine catches on the southern Horns Reef grounds did not differ from those stated in April 1927—30 in the same region. We have, however, hinted already at the probability of a relatively slow growth of the rich year-class 1928 in consequence of its great density. The German investigations showed indeed that the rich year-class 1928 (III-group) was 2 cm. smaller on an average than the III-group of the two preceding years, due account being taken of the influence of the change in the gear (covered codend). Consequently the year-class 1928, in spite of its considerable strength, did not play a great part relatively in the catches of the German cutters during 1931.

During the German investigations an attempt was once more made to assess the growth during the single years (growth periods) by measuring the width of the year-rings in the statoliths. A preliminary report on the aim and method of these attempts has been published[1]).

4. Seasonal Distribution of the Stock.

In May the stock off the North Frisian coast was found accumulated unusually far inshore and in quite shallow water, the distribution being quite similar to that one observed in the month of March (1926).

Also the Dutch investigators found the main stock in May quite near the coast and caught only few plaice in somewhat deeper water, especially at the offshore positions of the Haaks section and Brown Bank section.

5. Investigation of younger Stages.

(Cf. chapter B I 2.)

6. Food of Plaice.

(Cf. chapter B I 4.)

7. Marking Experiments

were carried out by the Lowestoft Laboratory in May and November 1931. The particulars of recapture both for these and the 1930 experiments have not been fully worked up, but the following table gives some provisional results:—

May 1930:	Schiermonnikoog	Haaks Light Vessel
Number liberated	549	348
% returned in 12 months (approx.)	21 %	22 %
November 1930:		
Number liberated	380	340
% returned in 12 months (approx.)	22 %	30 %

[1]) A. Bückmann, Breitenmessungen an den Jahresringen und ihre Anwendbarkeit bei der Untersuchung der Nordseescholle. — VII[e] Congrès international d'Aquiculture et de Pêche, Paris 1931. Rapports.

May 1931:	Graa Dyb	Sylt	Heligoland	Borkum	Haaks
Number liberated	1,001	1,007	1,006	1,004	1,004
% returned to the end of Sept. 1931 (approx.)	22 %	21 %	24 %	13 %	29 %

In November 1931, 1,016 plaice were marked near Terschelling. This experiment is intended to serve as a control for the marking experiments carried out in May, as it has been suggested that when plaice are marked in that month, — that is to say at the beginning of the period of most rapid growth — the operation may check the normal growth. As a rule very few plaice are recaptured in the winter months, and it is hoped that sufficient data will be obtained, in order to compare the summer growth of plaice, which were marked at the beginning, with those that were marked at the end of a growth period.

Plaice marking experiments carried out by the Bergen Laboratory on the Norwegian coast gave some results of general interest: A plaice marked and liberated off Tananger near Stavanger on the 14th of January 1931 was taken 99 days afterwards at North Shoals, Dogger Bank, about 520 km. from the locality where liberated. The travelling rate was thus more than 5 km. per day, probably the fastest travelling found from plaice markings. As another plaice from the same marking experiment was caught at the Viking Bank, the marking shows that an exchange may be effected between the plaice stock of the North Sea and that of the Norwegian coast especially in connection with the spawning migration.

V. Other Fish.

Anchovy. At Boulogne the study of this fish was taken up in using the methods practised in the investigations of Herring and Sardine.

Here may be mentioned the unusually far Eastward penetration of the anchovy (Jade-Elbe) and in connection herewith the discovery of planktonic eggs near Heligoland in July, which generally are not found further East than the Ems-estuary. The larvae were observed repeatedly until autumn in the plankton near Heligoland. In October the "Poseidon" caught advanced stages of 24—46 mm. (mean 40 mm.) from off Amrum to off Borkum and also quite near to the mouth of the river Elbe (cf. "Der Fischerbote" 1932, p. 45 and 48).

Mackerel. The investigations concerning the stock of mackerel, as initiated in 1930 at Boulogne (measurements, age- and sex-determinations) were continued in the year under report.

Sole. At Heligoland the measuring, sex-, maturity- and age-determinations were continued. Scales of 377 specimens were read. In the two preceeding years small soles were very scarce and the stock consisted mostly of descendants from the good years 1924 and 1926. In 1931, one and two year old soles appeared in more considerable number. It is, however, difficult to judge of the importance of the phenomenon, as the covered codend retains these small fishes much better than the common codend, exclusively used in former years.

At all events it may be mentioned, that the year-class 1929 has not been a failure, although after the cold winter 1928—29 the stock of soles in the German Bight was sensibly diminished and these fishes did not reappear before later in the year — in moderate numbers. The data concerning the evaluation of the stock are being prepared for publication.

Sprat. The Belgian work on sprat was thwarted by the failure of the fishing in its second period and by the above-mentioned want of a ship. However, a sample of 1 Kilogram from every fishing day was examined and submitted to the usual laboratory work: size, weight, scales, otoliths, state of gonads etc. The calendar year 1931 has been made to include the end of the 1930—31 sprat season and the beginning of the season 1931—32 (in the English sprat investigations). — Commercial sprat samples were sent from the South and East coasts from January 1931, until the end of the season, and the data obtained showed little variation from that of the previous season in point of size or age-composition of the shoals, I-group fish predominating. From October onwards regular commercial samples, supplemented by sprats caught by the research vessel "Onaway" were examined, and, while the results have not yet been worked out, it appears that the modal lengths are considerably greater than in the two preceding seasons, probably owing to a predominance of II-group fish.

Whitebait samples were examined regularly from January to the beginning of the close season (August), and two further samples were obtained in October, but the subsequent scarcity of whitebait prevented further samples from being sent. A noteworthy feature of the Thames whitebait was the very low percentage of young herrings.

In November a shipment of sprat from Lowestoft to Norway (Haugesund and Bergen) was undertaken and samples taken for investigation at the Bergen laboratory. The sprat had been caught at Brightlingsea on the 23rd of November and consisted of about 83 per cent. of the year-class 1930, 13 per cent. of the year-class 1929 and 3 per cent. youngfish, year-class 1931. This is about the same composition as was found in samples from Lowestoft (Brightlingsea) and Ostende during the fisheries in November and December, 1926, only the amount of youngfish was then somewhat larger. — The mean value found by counting of the vertebrae was 47,705. In 1926 the corresponding value for the Lowestoft sprat was found to be 47,625 and for the Ostend sprat 47,714.

Near Heligoland and off the estuary of the river Elbe a spawning of the sprat in autumn was observed (as occasionally in former years) and the occurrence of pelagic eggs in mid-October and of young larvae in December and in the commencement of the year was noted. These observations seem to indicate that we have not to deal with a prolongation of the summer spawning in this case, but with a separate and timely independent, though insignificant, spawning.

Thunnus thynnus. The study of this fish has been continued at Boulogne in co-operation with the International Committee for the scientific Exploration of the Mediterranean.

VI. Shellfish.

The crab (*Cancer pagurus*) marking experiments and the investigation on the periwinkle (*Litorina litorea*) have been mentioned above (B I 2).

The observations concerning *Pecten maximus* on the French coast of the Eastern Channel reveal the growth rate of this bivalve. The length at the end of the first year of life is 45—70 mm., at the end of the second it is 80—100 mm.

On behalf of the English Ministry of Agriculture and Fisheries the oyster breeding experiments were continued at Conway and Lympstone bearing mainly on the food of the larval oyster.

The oyster investigations of the Heligoland Laboratory were devoted in this year to the study of the anatomy and physiology of the larvae, acquired by successful rearing experiments in small tanks. Several thousands of such larvae became fixed in these tanks. By means of a special plankton net it was possible to compare the quantity of pelagic oyster spat in the North Frisian Waddensea near Sylt with the numbers taken in the same way and at the same date in the Dutch Waddensea (Eastern Scheld) by a Dutch investigator. In a small oyster-basin on the shore of Heligoland rearing experiments with Dutch seed-oysters were carried out. A comprehensive report on the investigation and culture of oysters in Germany has been published[1]).

The experiments of rearing lobsters artificially have been concluded after gaining the conviction that the reliable working of a hatching and rearing establishment with limited funds cannot be expected, firstly on account of the considerable costs for the necessary cleaning of great quantities of sea water and removing of detritus and other harmful material, secondly on account of the water temperature, which in most years is too low near Heligoland. This low temperature protracts the time till the 4th larval stage is reached and the young creatures may be liberated, and thereby increases the loss during the rearing time in a practically intolerable degree. On the other hand a method of increasing the progeny, as practised over several years, has been continued. This consists in the keeping of as many berried females as possible with ripe eggs in large wooden boxes moored on the road of the island, until all larvae have hatched, and then returning the mother lobsters to the fishermen for sale.

In spite of the growing intensity of fishing, the yield of the lobster catch of Heligoland has increased in recent years, and undersized young lobsters have been caught in greater numbers than formerly. Reports on the lobster investigations are being in preparation.

C. Benthos and Deposits.

During the cruise with the "Japetus Steenstrup" in Nissum Broad (Limfjord) valuations of the sea-bottom with Petersen's bottom sampler were carried out.

The valuation area off Norderney—Borkum has been investigated this year in May extensively on 147 stations and in October on 53 stations; and herewith this work carried on since 1925 has been finished. The concluding publication cannot be expected within a year, therefore it may be useful to report here somewhat in detail on the results of 1931 in connection with those given already for 1930 (Rapp. Proc.-Verb. LXXIV, p.176).

Polychaets. With exception of the stations near the coast (10 m. depth) they

[1]) A. Hagmeier. Wissenschaftliche Forschung und praktische Wirtschaft auf den fiskalischen Austernbänken. — Zeitschrift "Nordelbingen". Bd. 8, 1931.

play the greatest part in normal years. The density in which they live shows the highest figure after the Echinoderms (gross weight per 1 sqm.). Often, especially in autumn, there appear patches of great density which, however, generally disappear again until the next spring. The great quantities of *Lanice conchilega* and *Pectinaria koreni* stated in August 1930 resolved into rather small remnants found in May 1931. In October 1931 it was *Ophelia limacina* which predominated. The density of the *Nephthys* species (especially *N. hombergi* and *N. caeca*) is very even.

With regard to the short lifetime of most of the polychaets, which are also great favourites of the fishes, the figures of density as stated (3.9—10.0 g. per sqm.) seem to signify a strong productivity of this group and so much the more as the gross weight is not increased by calcareous skeletons or heavy shells.

Molluscs are heavily represented only by the great populations of *Macoma baltica* and only near the shore (< 10 m. depth). All deeper stations show considerable stocks only if a general development of one certain bivalve species occurs. Since 1928 this has not happened again, but, as mentioned in our last report, the species *Syndosmya alba* predominated to a certain degree since autumn 1930. In 1930 also its occurrence was noted on several sections but not in especially dense patches. *Tellina fabula* occurred as numerous young animals. Also *Spisula solida* was more common than in other years; *Cultellus pellucidus*, however, was nearly completely absent. Of Gastropods *Bela turricula* was in 1931 more abundant than others. Living density of the bivalves in 1931: between 1.9 and 15.5 g. per 1 sqm.

Crustaceans played a small part only. The most frequent species were *Bathyporeia norvegica* and *B. pelagica*; the former species was in 1931 frequent and abundant. *Gastrosaccus spinifer* occurs in some places. Of Cumaceans there occur *Diastylis bradyi*, *Lamprops fasciata* and *Iphinoë trispinosa*; Decapod Crustaceans only as single individuals. Living density only 0.2—0.6 g. per 1 sqm.

Echinoderms are rather regularly represented by *Ophiura texturata*, *O. albida* and *Echinocardium cordatum*. The latter species was found for the first time again near the coast in May 1931, since the cold winter 1928—29, and this as individuals arising from the year 1930. Of the gigantic quantities of this year-class observed in August 1930 only small remnants were left in 1931. Most of these animals obviously had not survived the winter near the East Frisian coast. (On the other hand a heavy settlement of *Echinocardium* from the year 1930 was noted near the East Frisian coast in 1931). On most of the sections of the valuation area the gross weight of the Echinoderms made up the main part of the total gross weight i.e. 4.6—64.6 g. per 1 sqm.

The total gross weight per sqm. in the valuation area was in 1931 somewhat higher than in 1930 and amounted for the single sections to 11.5—72.3 g. per sqm. The gross weight for 1 sqm. without Echinoderms was in 1931 6.3—21.9 g.

In May 1931 it was possible by the help of the echo sounding apparatus to take the ridges, dales and holes of the sea bottom into consideration on a special section of the valuation area. Within a small district, with differences in depth of a few metres only, diversities of colour and composition of the sediment and of the inhabiting animals could be stated.

The valuation area is occupied by a single biocoenosis, which has great similarity with the Venus-community as described by Petersen. We distinguish, however, clearly two soil-communities as subcommunities, one in loose coarse sand (which is penetrated by the grab of 100 kg weight to 6—8 cm.) and the other in firm fine-grained and often somewhat muddy sand (in which the grab penetrates only for 3—5 cm.) A third subcommunity is characterized by the preponderance of members of the *Macoma baltica* community. The two soil communities are not sharply separated from oneanother and occur alternately with the changing character of the sediment. — The most characteristic forms of the loose coarse ground are: *Thracia papyracea*, *Spisula solida*, *Ophelia limacina*, sometimes *Aricia cuvieri*, *Aonides paucibranchiata* and *Echinocyamus pusillus*; the characteristic animals of the finer and firm ground are amongst others: *Syndosmya alba*, *Syndosmya prismatica*, *Tellina fabula*, *Spisula subtruncata*, *Pectinaria koreni*, *Magelona papillicornis*, *Spiophanes bombyx* and *Echinocardium cordatum.* A special *Syndosmya alba*-community does not occur near the Eastfrisian coast.

In the more open part of the Southeastern North Sea the bottom fauna was investigated as formerly on all stations of the sections: May 1931: Graadyb-, List-, Amrum- and Hever-section (69 samples); October 1931: district near Amrumbank, and western oysterground (26 samples).

The density of the animal life and the general aspect afforded by the populations of the sandy grounds (down to 40 m.), W. of the Jutland peninsula, shows much resemblance to the valuation area off Norderney-Borkum. The stations of the List-section near the coast and of the Graadyb-section receive, however, a special character from the appearance of *Nucula nitida*, recalling the *Syndosmya alba* community off the mouth of the river Elbe. The mud grounds of more than 35 m. depth, including the oysterground, contain the *Echinocardium-filiformis* community, particularly rich in species. As a characteristic inhabitant may be considered *Callianassa subterranea* besides the known forms (*Amphiura filiformis*, *Echinocardium cordatum* and *flavescens*, *Turritella communis*, *Pectinaria auricoma* a. o.).

The taking of notes concerning the epifauna in species and number of the animals in the trawl catches of "Poseidon" were continued. In accordance with a suggestion of the Consultative Committee (Rapp. et Proc.-Verb. 1930, LXVI, p. 28, II), the material collected has been utilized for drawing a chart with a characterization of the fishing grounds of the S.E.-North Sea in regard to the epifauna (Rapp. et Proc.-Verb. 1931, LXXIV, p. 54).

On the nature of the bottom in the German Bight, as far as size of the grain, species of the minerals and remains of organisms are concerned, especially Foraminifera, an elaborate publication has appeared[1]). Also a small paper on *Amphioxus* was published containing observations on the deposition of the eggs in captivity[2]).

[1]) O. Pratje. Die Sedimente der Deutschen Bucht. Eine regional-statistische Untersuchung. — Wiss. Meeresunters. N. F. Abt. Helgoland, Bd. 18, Nr. 6.

[2]) A. Hagmeier und J. Hinrichs. Bemerkungen über Ökologie von *Branchiostoma lanceolatum* (Pall) und das Sediment seines Wohnortes. — Senckenbergiana Bd. 13, S. 255—267, 1931.

D. Plankton.

On board the fishery cruiser "Zinnia" planktonic work — as well as hydrographical — has been performed weekly on the line from Deal to Gravelines, in connection with the littoral herring and sprat studies.

On the part of England Plankton cruises were made during April and October for the purpose of locating concentrations of Phaeocystis in positions likely to affect the shoaling of herring, but none were found. Plankton samples were also collected on two trawling cruises in November with the same objective, and a similar result. — Another cruise was made in June with the object of charting the distribution of plankton on the Great Fisher Bank and Klondyke Bank, where liners were collecting herring stomachs for the Ministry. HARDY's Continuous Plankton Recorder was used for this purpose and the material collected was sent to Prof. HARDY to be worked up.

During June the motor vessel "Onaway" was engaged amongst the drifters in the Shields area carrying out experiments with HARDY's small indicator, and promising results were obtained. There was a suggestive correlation between the numbers of *Calanus* caught on the discs and the catches of herring.

A series of three short cruises of the "George Bligh" in the Humber area was projected for September, to search for organisms inimical to the herring. The HARDY Continuous Plankton Recorder was to be used for this purpose, but owing to the loss of the instrument on the first cruise the work was curtailed; HARDY's small indicator was, however, used on two cruises.

A report was published on the validity of single vertical hauls of the International net in the study of the distribution of the plankton[1]).

Also from the German side the occurrence of *Phaeocystis globosa* was observed with special attention. As mentioned above (chapt. B III 4), it was obvious in May that the young herrings as well as their larvae were almost completely absent in the region of exuberant growth of *Phaeocystis* but were frequent in regions without *Phaeocystis*. This does not prove, though, that the distribution of the herrings is really influenced or even determined by *Phaeocystis*. Near the East Frisian coast the algae inhabited all water layers; further off (about 15 miles distant from the coast) they were more numerous in the deep; still 5 miles further out, N. of 54° N., they occurred only in the deep layers and also in great quantities, though apparently in a gradually decreasing condition, for the gelatinous mass of the colonies contained here less single individuals and were more intensely penetrated by endophytic Nitzschiae. The frequency in numbers was stated in counting the colonies in quantities of water supplied with the water sampler. The counting in a fresh estate on board does not make any difficulties. In the usual preserving fluid the colonies will soon decay. The fixation in Fleming's fluid seems to promise a better durability. The highest frequency observed was 2.3 colonies per 1 ccm. of water (near Borkum) but quantities of 1 or 2 per ccm., were more frequent at the surface as well as near the bottom.

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[1]) A. C. GARDINER. The Validity of Single Vertical Hauls of the International Net in the Study of the Distribution of the Plankton. — Journ. Mar. Biol. Assocn., XVII, 2, 1931.

The usual observations on board the "Poseidon" concerning the distribution of the more abundant plankton organisms in the catches of fish brood were continued as heretofore.

A report is being prepared on the results of the comparison of different kinds of vertical nets with special regard to the capture of fish-larvae.

During the French and Scottish research cruises and on the lightship "Sandettie" plankton samples were taken in connection with the hydrographical observations.

E. Hydrography.

Belgium. Observations have been carried out weekly on board the "Zinnia" on the line Deal-Gravelines during the herring and sprat season. Salinities and temperatures were sent to Copenhagen to be combined with the data supplied by France and England in the same transitional region.

Denmark. During the year the return of a considerable number of the drift-bottles liberated in the North Sea in October 1930 from the "Dana" has been stated. Of 75 bottom drift-bottles, put out at the western part of the Dogger Bank on October 17th, 34 have been returned, all except 3 on the Dogger Bank itself though a little to the South of the place where they were liberated. Of the 75 surface drift-bottles put out at the same locality and date 45 have been returned, mainly at the Norwegian coast from Kristianssand to Magerø. Of 25 surface drift-bottles put out on the Little Fisher Bank on October 28th 11 have been returned, all from the Bohuslän coast.

England. During the entire year without cessation, drift indicator work has again been in train from the two English light-vessels Varne and Cromer Knoll. An unbroken series of records from the Varne for about five and a half years is now available, and the successive three-day records are, as previously, worked up into a form which enables one to know the mean current representative of individual months, seasons, etc. The second report upon the water exchange between English Channel and North Sea is in hand, and the results are being amplified by drift-bottle experiment data. Further the winds are now receiving additional attention. Each month's winds (at the Varne Lightvessel) are now being worked up into the form of residuals, and relationships between wind and current are being sought in the hope that it may become possible to argue what currents must have characterised periods of interest earlier than such as fell within the time span of the present routine current measurements — this by working up wind data for years previous to say, 1925.

After the second report on the Varne current measurements has been published, the future records will find a place in the Bulletin Hydrographique, in keeping with a resolution of the International Council. Progress is being made too, with the preparation of a report upon the water movements past the Cromer Knoll Lightvessel.

A noteworthy feature of the year in point of Dover Straits currents, was the unusual state of affairs in August, September, October of 1931. In August, the flow

from Channel to North Sea was almost completely "held up", and in September and October, it was definitely reversed. This is in harmony with the marked dominance of winds from the N.W. quadrant during these three months. Drift-bottles put out at various places in the Channel during the summer of 1931 in furtherance of a particular scheme, have yielded information of relevant interest. From International Station E 2 (about half way between Plymouth and Ushant) bottles put out on 1st August, 1931, travelled westwards. Some stranded near Lands End, some in the Scillies, and some in Anglesey and even further up the Irish Sea. Interesting is it to record that strandings in the Scillies resulted with bottles having drags hung one fathom beneath them. In the course of five or six experiments made at comparable times in previous years, no such westerly travel resulted, but in 1931 the winds were such as to modify the most usual current regimen of the Channel profoundly, as the Dover Straits currents above referred to, demonstrate.

Whilst the particular drift-bottle experiment quoted, does not fall strictly within the purview of the Southern North Sea Committee, it is mentioned as throwing additional light upon the current between North Sea and English Channel.

A useful programme of drift-bottle work to commence in February 1932, has been arranged. Weekly liberations of bottles will be made from three lightvessels in the Southern North Sea and from a position in mid-channel at longitude 1° W.

The routine observation of surface salinity and temperature has been maintained precisely as in former years. The list of routes and lightships in the North Sea, English Channel and North Atlantic is given in Rapp. et Proc.-Verb., Vol. LXVI, 1930, p. 136.

Observations at various depths in the Southern North Sea have been made on four cruises of the "George Bligh", in April, May, June and October. This work was connected with plankton and herring investigations. A fifth cruise, in June, was devoted to the study of salinity distribution and water movement in the Eastern English Channel. This work, continuing a series of such cruises, was done in co-operation with one of H. M. Fishery Protection Vessels, H.M.S. "Boyne".

A few inshore observations have been made from the motor-boat "Onaway".

The Dove Marine Laboratory, Cullercoats, has continued the series of hydrographical observations in the coastal waters off Northumberland; seven cruises were made (M.V. "Evadne"), in February, April, May, June, July, August and September—October.

Copies of all data so obtained are forwarded when available to the Bureau in Copenhagen.

The salinity titrations have been carried out as before at the Government Laboratory, London.

The greater part of the Year's work has been the computation of the salinity and temperature normals in the English Channel for the 25-year period, 1903—1927.

France. In continuation of last years observations and besides regular meteorological statements there were taken water-temperatures and salinities on board of the "Sandettie" lightvessel from 1st of January to 26th of June 1931 daily, 2 hours before and 3 hours after each high-water at the time of the strongest current, near the surface

and at the bottom. Moreover the cruises mentioned above (Work at sea) of the fishery patrol boats and research vessels secured determinations of temperature and watersamples from many positions in our area.

Germany. Routine observations. 1) Surface observations (t and S) at Heligoland-road on the same days as on board the lightships, once at high-water and once at low-water. 2) At 4 positions round about Heligoland every fortnight, at the surface, in 10 (or 15 or 20) m. and at the bottom, t and S. 3) On board of 9 lightvessels (Borkumriff, Norderney, Weser, Bremen, Minsenersand, Elbe 1, Elbe 4, Ausseneider and Amrumbank) every third or fourth day, once at high-water and once at low-water, surface observations t and S. Moreover on board of Borkumriff and Elbe simultaneously at the bottom, t and S. On all lightships named the direction and strength of the surface current is measured daily every 4 hours and also the time of the tide's turning is determined. 4) on the route Cuxhaven to New York watersamples were taken in the North Sea as heretofore (about 30 per month).

The observations mentioned under 1), 2) and 4) were sent to Copenhagen for publication in the Bulletin Hydrographique. The observations made on board the lightships were published as heretofore by the Deutsche Seewarte at Hamburg. The observations of 1929 appeared in the year 1931[1]), those of 1930 are in the press.

Special observations were made during 2 cruises of the "Poseidon":—

1) From 2nd—14th of May there were made in the German Bight 67 hydrographic stations with 214 temperature-, 195 salinity- and 108 phosphoric acid-determinations at different depths; also during the voyage 148 t and S and about 45 phosphoric acid-determinations were made between the stations. For the completion of these investigations surface observations (t and S) were made on the nine lightships mentioned above under 3), and also on the lightships Elbe 2 and Elbe 3 from 25th of April to 18th of May. They were made there daily once at high-water and once at low-water, and also from the Hapag steamer "Adler" on different points between Cuxhaven, Heligoland and Sylt.

2) During the cruise (from 13th until 20th of October) into the German Bight and to the south edge of the Dogger Bank, 24 hydrographical observation positions were made with 118 t and S and 42 Oxygen determinations, besides 93 surface observations of t and S between the positions. For completion of these data the named lightships were again in activity from 11th—25th of October as in May, and also the steamship "Adler".

The results of the phosphoric acid determinations in May have been published[2]). The general working out of the hydrographical situation in the German Bight has been continued, it will be finished shortly with inclusion of the material of 1931. The treatment of the current observations on the lightvessels Borkumriff and Norderney is in preparation.

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[1]) Deutsche Seewarte, Meereskundliche Beobachtungen auf deutschen Feuerschiffen der Nord- und Ostsee. Jahr 1929. — Hamburg 1931.

[2]) K. Kalle. Phosphatgehaltsuntersuchungen in der Nord- und Ostsee 1931. — Annalen der Hydrographie 1932, Heft 1.

Holland. The observations of temperature and salinity were continued on three lightships and on the steamer-routes Flushing—Harwich, Rotterdam—London, and Amsterdam—Hull.

Norway. Temperature and salinity observations have been carried out weekly on the Bergen—Newcastle and Bergen—Rotterdam routes.

Scotland. During all cruises of the "Explorer" in our area serial collections for t and S have been carried out on selected positions, and surface drift-bottles have been liberated.

TRANSITION AREA
1931.

By H. Blegvad.
(Acting Chairman).

The co-operative work in 1931 concerned mainly the Plaice and the Herring.

As regards the Plaice the year-class 1931 (0-group) was found to be very poor at the coasts of the southern Kattegat, the Belt Sea and the western Baltic but considerably richer in the northern Kattegat (Fig. 1).

The year-class 1930 (I-group) was very poorly represented in the catches at the coasts of the Baltic but was more numerous at the coasts of the northern and the western Kattegat (Fig. 2).

Fishing experiments for Herring fry were carried out with a 2 metres stramin ring-trawl from Denmark, Germany and Sweden in the month of October (Figs. 3 and 4).

The Autumn Herring of the eastern Kattegat.

In the eastern Kattegat the number of larvae seemed to be below the normal but only a few stations were taken.

The Autumn spawning Belt Herring.

The catches of larvae in the south western Kattegat and the Great Belt were considerably richer than in 1929 and 1930.

The Sound Herring.

Comparatively great catches of larvae were taken in the waters off the coasts of Sealand—Møen—Falster. The catches in the Arcona Basin and at Rügen were, on the other hand, unusually scanty.

The Autumn Herring in the Hanö Bay.

The catches in the Hanö Bay were small.

Denmark.

Biology (Dr. Blegvad).

The vessels used for investigations in 1931 were as follows: s.s. "Japetus Steenstrup" from March till the end of October. A motor-boat in July and August.

Fig. 1. Number of plaice of the 0-group (year-class 1931) taken per fishing unit in the summer and autumn of 1931. The fishing unit used was a 30 minutes' haul with Johansen's young plaice trawl.

Fig. 2. Number of plaice of the I-group (year-class 1930) taken per fishing unit in the summer and autumn of 1931. The fishing unit used was a 30 minutes' haul with Johansen's young plaice trawl.

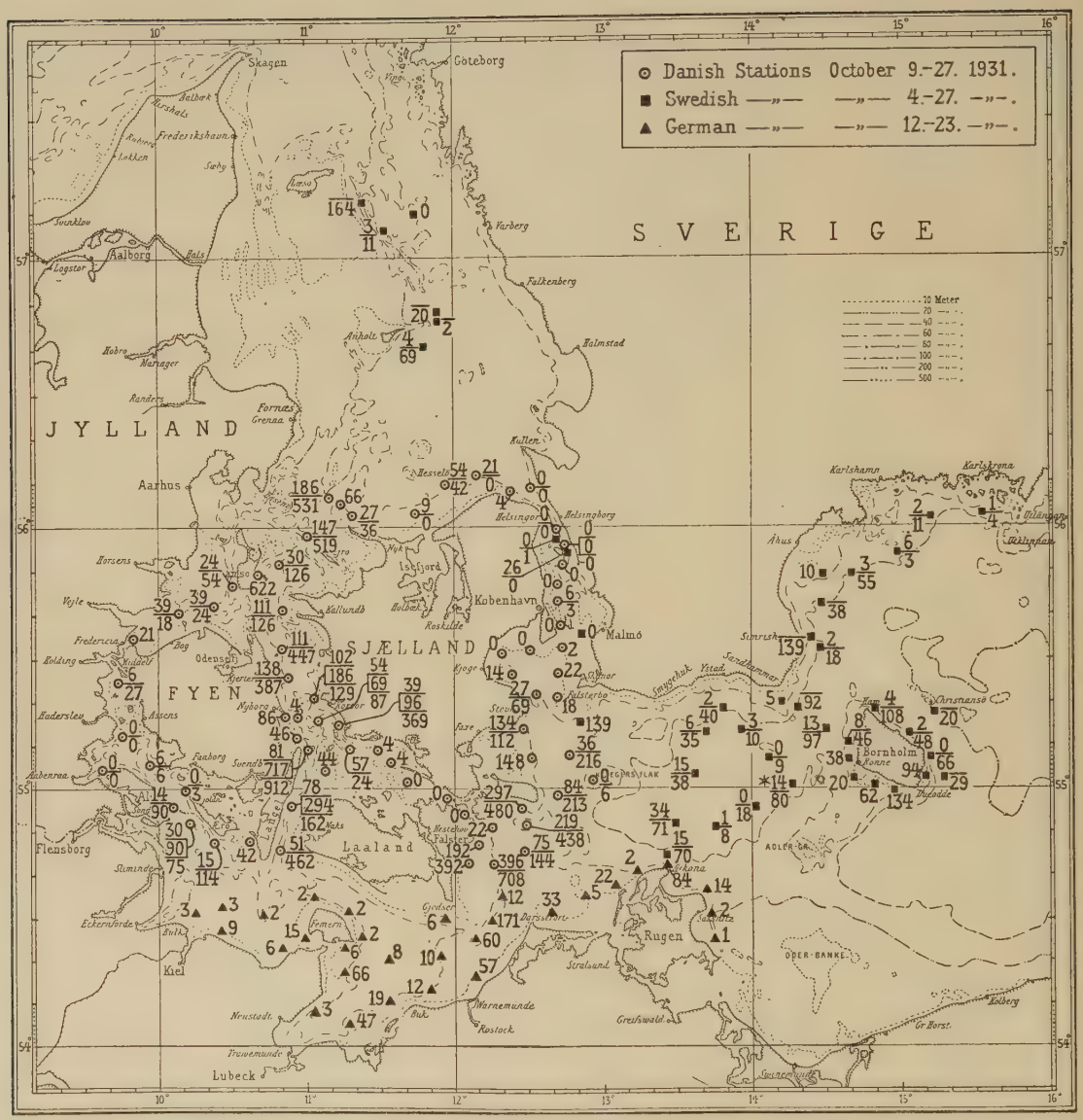

Fig. 3. Total number of herring larvae taken per 30 minutes' haul with a 2 metres stramin ring trawl in the autumn of 1931. — Where more than one figure is given at one station, the upper figure indicates catch in the upper layer (0—15 metres depth), the lower figure catch at the bottom; a figure between the lines indicates catch at intermediate depths.

* Step haul, 30—5 m.

Plaice Investigations.

Fishing experiments with a fine meshed otter trawl ("Tog") were carried out from the s.s. "Japetus Steenstrup" throughout the whole Transition Area from the Skagerak to Bornholm and the Oder Bank.

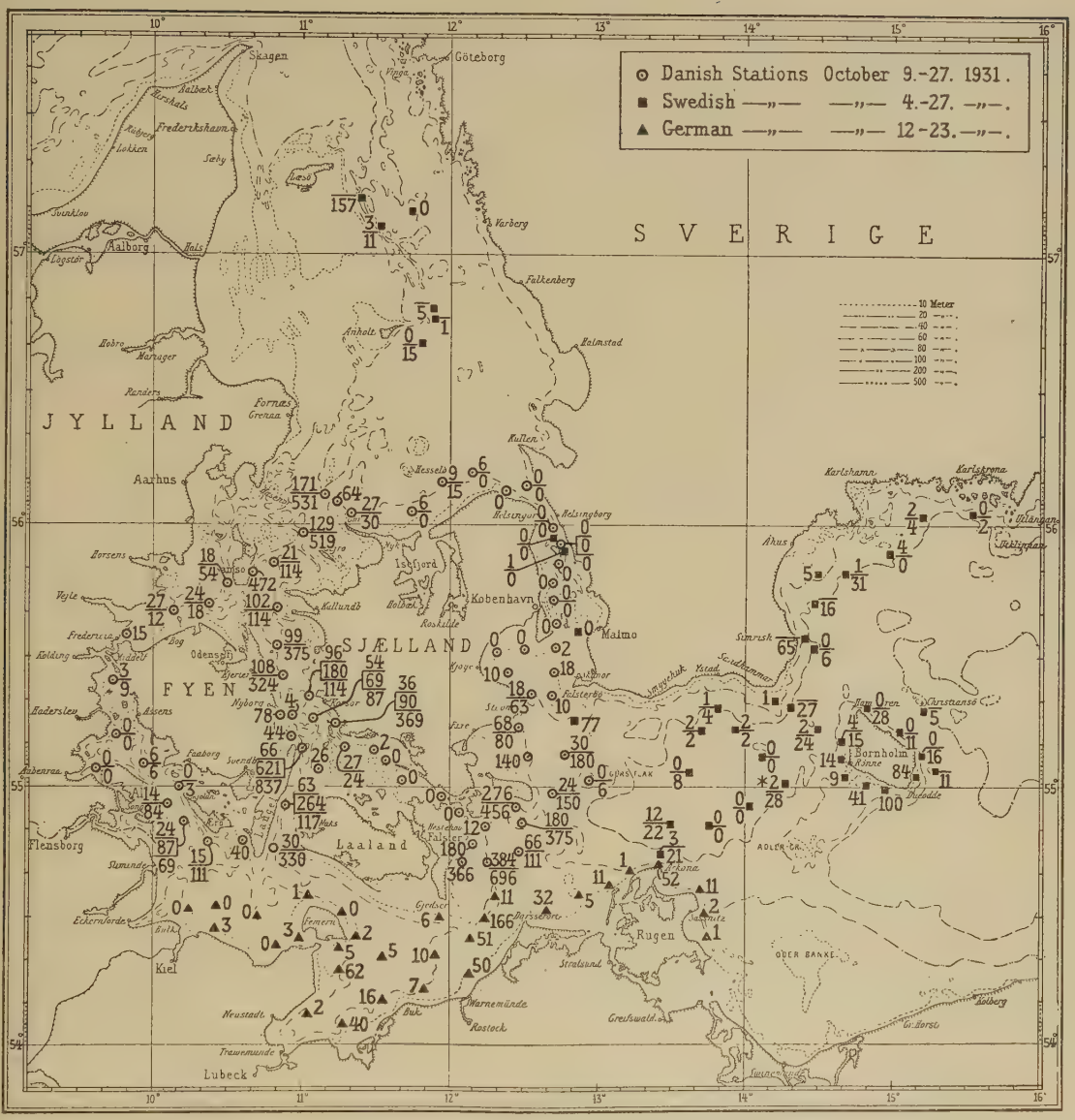

Fig. 4. Number of herring larvae of 6—9 mms. length taken per 30 minutes' haul with a 2 metres stramin ring trawl in the autumn of 1931.
For explanation of figures above and below the lines see fig. 3.

In the Aalbæk Bay—Herthas Flak area the plaice of group III (year-class 1928) and of group II (1929) were predominant. In the Belt Sea the stock was extremely poor; in some places the I-group (year-class 1930) was still found in appreciable quantities.

Fishing experiments from a motor-boat for plaice of the 0-group were carried out on the coasts of the Kattegat, the Belt Sea and the western part of the Baltic proper.

The 0-group was found to be below normal in the Kattegat and the Belt Sea as well as in the Baltic.

Investigations concerning the racial characters of the plaice were carried out especially in the Belt Sea and the Baltic. Erik M. Poulsen: "Analyses of Stock and Race of the Baltic Plaice during recent years". (Rep. Dan. Biol. Stat., XXXVII, 1932)

In the month of April and in the beginning of May abt. 114,000 kg. or abt. 1,190,000 young plaice were transplanted from the Horns' Reef Grounds to the Belt Sea, the western Baltic, the southernmost Kattegat and the Sound. Of the transplanted plaice 2,300 were marked. Until January 1932 a total of 34 % were recaptured; the growth of the recaptured plaice in the period April—January was abt. 12 cms. in mean, and on the whole only small migrations appeared to have taken place. About $^1/_3$ of the plaice put out in the Sound were captured by Swedish fishermen whilst a few of those put out in the western Baltic were recaptured by German fishermen.

The results of these marking experiments are thus in good accordance with those carried out in connection with the transplantations in 1928, 1929 and 1930.

During the winter of 1931—32 investigations of the fishermen's catches were carried out in order to get a view as to how large a part of the catches was made up of the transplanted plaice; about 25 % in mean were found to be derived from the transplanted plaice.

Flounder and Dab.

Investigations as to age, length, maturity and food were carried out. Special stress has been laid upon the study of the flounder in the Baltic; a paper by H. Blegvad "On the Flounder (*Pleuronectes flesus* L.) and the Danish Flounder Fishery in the Baltic" has been published in Rapp. et Proc.-Verb., Vol. LXXVIII, 1932.

Cod and Haddock.

The cod and haddock caught by the "Tog" were investigated as to age, length, maturity, and food. On the basis of the Danish investigations concerning the cod especially in the later years the following paper has been published: Erik M. Poulsen: "Biological Investigations upon the Cod in Danish Waters" (Medd. f. Komm. f. Danmarks Fiskeri- og Havunders., Ser. Fiskeri, Vol. IX, 1).

Herring.

The location of spawning places, by means of fishing experiments for the tiny larvae with the ring trawl were carried out in the months of March, April, May and October in the Kattegat, the Belt Sea, and the Baltic. The following paper has been published: Erik M. Poulsen: "On the spawning places of the herring in certain parts of the North Sea, the Skagerak, and the Kattegat in the autumn of 1930 and some earlier years (Medd. f. Komm. f. Danmarks Fiskeri- og Havunders. Ser. Fiskeri, Vol. IX, 3).

Mackerel.

Forecasts of the yield of the fishery in the northern Kattegat etc. and in the Sound were published by Aage J. C. Jensen in "Dansk Fiskeritidende" May 27th and September 2nd, 1931, respectively.

Eel.

A forecast of the yield of the silver eel fishing in Danish waters was published by Aage J. C. Jensen in "Dansk Fiskeritidende" August 26th, 1931.

Larvae of Spring Spawning Fishes.

During March, April, and May fishing experiments were carried out for the larvae of spring spawning fishes especially plaice, flounder, cod and herring.

Yearly Variations in the Yield of Fisheries.

A paper by Aage J. C. Jensen concerning the periodic fluctuations in the size of various stocks of fish and their causes is in print.

Bottom Invertebrates.

Investigations with the Petersen's grab as to the amount of bottom invertebrates were made in the Limfjord in the month of June and September, southwest of Bornholm in August and on the Oder Bank in September.

Plankton.

As in previous years vertical hauls with plankton nets of fine gauze and with Hensen Net were undertaken once a week from the three Danish light vessels: Anholt Knob, Schultz's Grund, and Halskov Rev.

As the summer herring fishery from Bornholm turned out to be exceedingly poor, investigations (with Hensen Net) as to the amount of food available for the herring were carried out around Bornholm in the month of August.

Searching for Fish Shoals from Air Craft.

Experiments on searching for fish shoals especially of herrings and mackerel were carried out at various terms in the autumn with the assistance of the Danish naval air craft. Shoals of herring and mackerel were observed in the Kattegat but in too small numbers to form a base for a rational search from air craft in the future. A paper by H. Blegvad on this subject is in print.

Water Pollution.

The pollution in the Sound caused by the sewage from Copenhagen was examined in May, September and October. Only close to the sewage outlet could an injurious influence of sewage discharged upon the bottom invertebrates be traced. Papers by H. Blegvad and Aage J. C. Jensen on the results have been published in Vol. XXXVII, 1932, Rep. Dan. Biol. Stat.

Hydrography (Professor Martin Knudsen).

According to a resolution of the Council hydrographical investigations, especially with respect to internal waves, were undertaken in the Transition Area and in the Baltic

in August 1931 under the supervision of a Committee with Prof. B. Schulz, Hamburg as Chairman.

The following countries co-operated in the investigations:

Denmark with one ship ("Japetus Steenstrup"), Finland with one ship ("Nautilus"), Germany with two ships ("Poseidon" and "Hunte") and Sweden with one ship ("Skagerak").

In connection with the investigations carried out from the above-mentioned ships different measurements were also made from lightships and measurements of the sea-level at certain coastal stations.

The programme adopted by the Commitee for the investigations was mainly carried out in all its details.

First some sections were taken at different localities in the Transition Area and in the Baltic. After these cruises continuous measurements were made from all five ships at certain fixed stations in the southern Kattegat with the ships anchored at the same places all the time. According to the programme these measurements were continued during a week.

Afterwards measurements at the same sections as at the beginning of the investigation were carried out from the different ships.

A very rich material consisting of measurements of temperature, salinity, oxygen, current and sea-level has been procured and also different special investigations have been carried out.

Of such special investigations may be mentioned, that on board the "Japetus Steenstrup" continuous measurements of the temperature were made from minute to minute in a constant depth of about 25 ms. for ca. 3 days; further that four water samples were taken by a special apparatus every two hours in the transition sheet with constant differences of about $^1/_2$ m. of depth.

On the Danish lightships "Lappegrunden", "Anholt Knob", "Schultz's Grund" and "Halskov Rev" special measurements were made of the temperature and the salinity every fourth hour and on the two lightships "Lappegrunden" and "Halskov Rev" also measurements of the current and the density by means of the pycnosonde were made.

At Anholt and Hesselö sea-level observations were made during that period in which the above mentioned 5 research vessels were co-operating in the Kattegat.

A working up of the material collected by each of the countries is now going on in the respective countries.

As was the case in previous years, hydrographical investigations have been undertaken in close connection with the biological investigations. These investigations consisted of measurements of temperature, salinity and oxygen. As far as the investigations have been undertaken in the open sea the results will be published in the Bulletin Hydrographique.

Investigations of temperature and salinity (with hydrometer) have been undertaken by the Danish Meteorological Institute as in previous years and will be published by the Institute.

Germany.

(Dr. Strodtmann and Dr. Fischer).

Biology.

The investigations of recent years have been continued. The monthly control, started in 1929, of market landings of plaice, flounder and dab was regularly continued in 1931 in 9 Baltic ports. In connection therewith investigations into the occurrence of the 0- and I-group of plaice and flounder on the coast were made.

In May, 1931, a certain amount of marked dab were put out in the Kiel Bight; until the end of the year under review about 15 % were recaught.

Investigations into the vitality of plaice caught during the close season in trawl nets have been started.

The longer cruises made were: a cruise of the Research Vessel "Poseidon" from the 16th May to the 7th June and in mid-October a cruise with a fishing cutter in the Oder Bank area.

Some results may be noted here:—

Plaice.

In the western Baltic evidence of only very small quantities could be found. In the autumn of 1930, Dr. Kändler (Erneuerung und Nutzung des Schollen- und Flundernbestandes im Gebiet der Oderbank, published in D.W.K.n.F. Bd. VI, 1931) found the 0-group in great numbers in the Oder Bank area. This occurrence was fully substantiated by the investigations in the spring of 1931. This year-class, which now constituted the I-group, was caught in relatively great numbers — up to 160 individuals per 30 minutes' haul — in the N. and N.E. of the Oder Bank at a depth of 15 to 25 ms. On the Oder Bank proper their number was smaller, the few catches in the neighbourhood of the coast brought no plaice of the I-group. On the other hand, the searching in October for the 0-group, year-class 1931, was in vain. In seven catches lasting 3 hours in all at a depth of 18 to 30 ms. one individual only was caught. The II-group which is usually the most numerous one on the Oder Bank, was very sparse. In spring, their number was far below that of the III-group. This is shown by a comparison of the results of 1930 and 1931.

Age-group	0	I	II	III	IV +
June—October, 1930	346	105	1523	290	5
(Year-class)	(1930)	(1929)	(1928)	(1927)	
May—June—October, 1931	1	626	136	964	106
(Year-class)	(1931)	(1930)	(1929)	(1928)	

Comparative catches regarding the frequency of the II-group in the years 1930 and 1931 gave the following averages, computed per 30 minutes' haul with the shrimp-trawl:—

II-group of the Plaice.

	Number of catches	Total Fish caught	Average of 30 minutes' hauls	
			All catches	Oder Bank
June 1930	6	693	62	100
October 1930	9	720	90	88
May—June 1931	22	43	3	5
October 1931	9	47	5	2

From these figures we can deduce that the relative frequency of the year-classes 1928 and 1929, is about 20:1. The bad spawning year 1929 yielded consequently only a 20th of the number of young produced in 1928. This is an enormous difference and exceeds by far all hitherto known fluctuations in the stock of plaice.

Of the plaice caught between the end of May and the beginning of June in the Bornholm Deep and on its slopes, 67 % belonged to the IV-group (year-class 1927), 21 % — almost exclusively males — to the III-group, and the rest (12 %) were older individuals of 5 years and more. Even if part only of the stock of mature plaice, at the time of the investigation, were still in the Bornholm Deep, the age-composition of the catches shows unquestionably how quickly the year-classes are exhausted by the present intensive fishery. With regard to the small percentage of the older plaice it must further be taken into consideration that the V-group (year-class 1926) belongs to a bad spawning year.

Flounder.

In the case of the flounder also the year-class 1929 has turned out worse than the year-class 1928, but the difference is not so great as in the case of the plaice. The relative figures of our catches for the II-group are as follows:—

II-group of the Flounder.

	Number of catches	Total Fish caught	Average of 30 minutes' hauls	
			All catches	Oder Bank
June 1930	6	2,049	182	298
October 1930	9	2,357	276	329
May—June 1931	17	700	54	99

This gives a proportion between the year-classes 1928 and 1929 of about 3 : 1.

In the catches of the Bornholm Deep the age-groups are distributed as follows: IV-group 48 %, III-group (males only) 19 %, V-group and above 33 %. As in the plaice,

so in the flounder the IV-group is most numerous, next follows the III-group. The percentage of the flounder of 5 years and more is greater, but the difference in the age-composition of the spawning shoals of both species is not very great.

The research material regarding the flounder collected in the course of these years in the eastern Baltic has been surveyed by Dr. Kändler in a report which will be published in the "Rapp. et Proc.-Verb." under the title of "Veränderungen im Flundernbestand der Ostsee durch die Fischerei".

Cod.

Especially race investigations were made. In the western Baltic big shoals of two-years old fish were found to exist. They differed visibly from the cod of the eastern Baltic by having less vertebrae and more rays on the second dorsal fin — as Johs. Schmidt has already shown. It is noteworthy that the number of the large fish has decreased perceptibly in this area as compared with former investigations.

In the Bornholm area the end of May and beginning of June was the chief season for the spawning of the cod. In the Gotland area and in the Bay of Danzig it was then fast approaching. The characteristics of the eastern Baltic are the relatively great number of vertebrae and the smaller number of the dorsal fin-rays, which elsewhere never are below 18. But the cod-material of the eastern Baltic is not uniform. The curves for the number of vertebrae show noticeable differences in the case of fish from the Bornholm Deep, the Danzig-, and the Gotland-Basins the number increasing to the east and to the north. The large cod are not — as previously presumed — a special race, which has immigrated. They too have the unmistakable character of the cod of the eastern Baltic. The cod of the Baltic is therefore no migratory fish. Especially in their youth they remain in the narrow limited areas of the shallow sea. For spawning, they prefer, in the east, the deeper grounds with higher salinity. The farther to the east the later the spawning season. In the western Baltic they spawn in March—April, off Bornholm in May—June, and off Danzig and Gotland in July—August.

The large cod of more than 50 cms. grow bigger and older in the deeper grounds to the east. Off Bornholm they average about 64 cms. and 6.1 years, off Danzig about 68 cms. and 6.9 years, off Gotland 73.5 cms. and 7.5 years. The differences in the growth-rate are not great in the various areas. From the fact that the cod are younger off Bornholm it may be inferred that the fishing in this area is more intense.

Herring.

The investigations as to the occurrence and the frequency of the larvae of the autumn spawning herring have been continued. A research cruise was made by Dr. Altnöder from October 12th to 23rd, 1931, and 30 stations in the area around Kiel Bight as far as Rügen were taken. The result was better than last year. A detailed report on this cruise appears in the "Ber. d. Deutsch. wiss. Komm. f. Meeresf.", Bd. VI, H. 2.

Race investigations regarding spring and autumn herrings were resumed; spring herring material from the Kiel Bight and Rügen was investigated.

Sprat.

Age and race investigations of the sprat have been started. To this end samples from commercial catches from the Kiel and Travemünde Bay were collected during the first and last months of the year. The working up of the material is now being commenced. On the cruise of the "Poseidon" the spawning season of the sprat was ascertained. Besides catches with the plankton-net for taking eggs and larvae supplementary fishing experiments were made with the herring trawl. In conformity with the eggs, spawning sprat were hereby evidenced at various places. A number of samples from the catches were preserved and will be worked up presently together with the material collected in the western Baltic.

Norway.

Biology (Dr. P. Bjerkan).

Sprat.

No special cruise for sprat investigations at the Skagerak coast or in the Oslofiord was undertaken during 1931. Samples of sprats from the commercial fishery were, however, made as usual. The difference in the size of the sprat of the year-class 1930, as mentioned in the report for that year, was found to prevail during the fishing season of 1931, and the size of the sprat from the special catches was thus very uneven. The larger sprat of the year-class was, however, dominant at least as the season advanced. The fishery was as usual dependent on the one year old sprat, year-class 1930, but older classes were found later in the season. The hydrographical conditions were somewhat adverse, and the fishery did not come up to the expectations based on the amount of young fish found during early spring. Young fish of the year-class 1931 were found very scarce during the autumn and seemed to be comparatively small, the average size not exceeding 6 cms. in September. Vertebrae counting has yet only been undertaken for a sample from a salt water pond, Soppekilen near Krageröe, and gave the extraordinary low value of 47.71. The value for the Norwegian sprat is usually about 48.0 or a little higher.

Eel.

In the later part of July and the early days of August investigations were undertaken about the eel fishing with trawls, and this was continued towards the end of August. During these investigations some hydrographical stations were taken from the State Hatchery m.c. "Ossian Sars" in some of the fiords. The temperatures were found to be somewhat lower than in the previous year.

Cod.

At the State Hatchery at Flödevigen the hatching of cod was continued, while the breeding of lobster was suspended as during the previous year, owing mostly to the construction of a larger and more efficient breeding apparatus. In September the usual investigations of cod fry in the strand region, in the fiords and coastal region were undertaken, and it was found that the fry were more abundant than during the preceding year.

Sweden.

Biology. (Dr. K. A. Andersson).

The research vessel "Skagerak" was used for biological and hydrographical investigations for nearly nine months of the year. Besides this short research cruises were made with the little motor-boat "Clupea", belonging to the Fisheries Laboratory at Lysekil, which was devoted chiefly to sprat and plankton investigations.

The investigations were concentrated on haddock, herring and sprat.

Haddock.

A large number of stations in the Skagerak were examined with a view to studying the stock of haddock. Measurements and age-determinations were carried out on a large number of catches. These investigations seemed further to confirm that the year-class from 1930 was very poor and that we have not had any good year-class since 1928.

This is evident from the number of haddock of I-group contained in the same fine meshed trawl after an hour's haul at the beginning of the years 1929—31. Below is a statement of the approximate average numbers:—

Year	Number of 1 year old haddock
1929	500—1500 (even up to about 23,000)
1930	11— 60 (highest 126)
1931	5— 40 (highest 70)

The numerical abundance of individuals of the several age-groups is also distinctly to be traced in the catches of haddock landed at Göteborg, as during the course of the year statistical data of the different sizes of haddock and the occurrence of the size-groups in the catches, are collected.

We have, however, — already in the early summer — made an attempt to determine the numerical abundance of the 0-group in the Skagerak thereby, possibly, to be able, at an early date to give forecasts regarding the future size of the haddock stock. This of course can happen only by comparing the numerical abundance of the 0-group in various years.

In June 1931 hauls were made with a 2 metres ring-trawl at six stations in the Skagerak between the Skaw and Hanstholm and haddock fry were taken at all stations. The number in each haul was not large but seemed to increase towards the west. This result could all the better be compared with material taken in hauls in other years during the same month and at about the same places. In 1930 hauls were made at nine stations in the Skagerak without a single little haddock being taken. Unfortunately we have no material from the good brood year 1928. But in 1926 we trawled at stations in the Skagerak and took haddock fry at all of them, with the exception of two. In this year, consequently, a relatively good year-class was developed.

There seems, therefore, in the Skagerak, to be a possibility of determining by an investigation of the numerical abundance of the tiny fry, whether a good year-class is developing or not.

The investigations made in June 1931 pointed to the probability of year-class 1931 being the source of a considerably richer year-class than 1930, and this proved to be the case, the trawlings at the end of the year showing that the 0-group occurred rather frequently. In three hauls, each of one hour, in the Skagerak in November and December, 40, 1200 and 307 individuals of the 0-group were taken.

Plaice.

In July trawlings were undertaken with Johansen's young fish trawl on the coast of Bohuslän and Halland for the 0- and I-groups of plaice. These trawlings were continued in October along the south and east coast of Skåne. The result appears on the charts (Figs. 1 and 2). In the southern Baltic the stock of plaice was examined by trawlings in February and October in the deeper water of the Bornholm area.

Flounder.

The investigations regarding the flounder have been concentrated on the southern Baltic. In the spring and autumn the stock of flounders was investigated by trawling in the deeper portions of the Bornholm area. Particular attention was paid to the growth conditions and the distribution of year-classes.

By experiments with Johansen's young fish trawl preliminary inspections along the south and east coasts of Skåne and off the Blekinge coast were made for the youngest year-classes of the flounder. 1931 seems to be one of the poorer brood years.

An abstract of the Swedish investigations regarding the flounder in the southern Baltic during recent years, is included in the report on the flounder, published by the Baltic Area Committee.

Lemon-dab.

In the course of the year material from the Göteborg fishmarket has, as previously, been collected, consisting of Lemon-dab of various assortments landed there. The working up of the material collected has been continued at the Fisheries Laboratory at Lysekil.

Herring.

In the autumn and winter a number of herring from the Skagerak, the Kattegat, the Sound and the southern Baltic were examined in regard to race and year-class.

The relatively good year-class from 1924 is still represented in the catches, though in reality it is now poor, nor does any particularly rich year-class seem to have made its appearance in the catches. In the Sound and the southern Baltic there had, however, in the autumn, begun to occur a two years old year-class i. e. from 1929. The fishery in these places was, however, very bad.

In March an expedition was sent to the southern Baltic to investigate the occurrence of herring there, at that time of the year.

At many stations in the Kattegat, the Sound and the southern Baltic investigations were made regarding the occurrence of herring fry (Figs. 3 and 4).

Sprat.

The sprat investigations were continued in accordance with a somewhat extended plan. From May to July extensive hauls were made for sprat's eggs and fry partly from the Fisheries Laboratory's motor-boat "Clupea" and partly from the "Skagerak" along the Bohus coast from the Norwegian border down to Marstrand and also in many fjords. In Uddevalla fjords there was found the existence of a decided spawning ground for the sprat whereas no spawning of any significance existed in the Bohuslän fjords. On the other hand the drifting in of eggs was very considerable in several of the more open fjords in central Bohuslän. Strangely enough the most northerly fjords of Bohuslän are quite devoid of sprat's eggs, where consequently not even the drifting in of such eggs seems to occur.

The investigation of the occurrence of the 0-group in the summer and autumn of 1931 gave the result that year-class 1931 was considerably poorer than that of 1930. A very large number of samples of sprat from various times and places was examined. At each examination a number of samples of scales were taken and at the same time the counting of vertebrae was carried out in at least 100 specimens. The counting of the vertebrae, the result of which is indicated by frequency curves has proved to be very effective and it is possible to get several data for the determination of the race question of the sprat. In the inner fjords of Bohuslän, especially in the Uddevalla fjords, a particular type of sprat is found. Outside the skerries a sprat of another race is fished in the late autumn and winter. In the outer Skärgårds area, just as in certain fjords, there often occurs a form of sprat which differs from both these types. Indeed the stock of sprats on the coasts of Bohuslän and in its fjords presents many peculiar features and a considerable number of difficult problems.

Plankton.

At the Fisheries Laboratory at Lysekil an investigation has been started partly with the object of finding out to what extent the growth of the plankton diatoms is affected by the ultra violet rays of different wave lengths and partly a preparatory attempt has been commenced to investigate the effect of the photosynthetically active wave length range of the visible spectrum on Phytoplankton.

Literature.

K. A. Andersson: Hurudana äro nu utsikterna för koljefisket i Skagerak? (A prospect for the haddockfishery in the Skagerak). Ny Svensk Fiskeritidskrift 1931, Nr. 19.
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A. R. Molander: Några iakttagelser över skarpsillen vid Västkusten. Ibidem 1931, Nr. 2.
— Investigation of Plaice off the west-coast of Sweden. Rapp. et Proc. Verb. Vol. LXXI. 1931.
— Rödtungefisket i Skagerack. Ny Svensk Fiskeritidskrift 1931, Nr. 24.

Hydrography (Prof. Otto Pettersson).

The hydrographical investigation work in Sweden during 1931 was carried out partly on board the research vessel "Skagerak" in the Kattegat and in the Gullmarfjord and also at Bornø Station where — besides the present reporter — Dr. Otterstedt and Fil. Magister Kullenberg were steadily engaged. The work was concerned exclusively with the investigation of the internal movements of the middle layers of the sea: *Vide* O. Pettersson, "Vattenutbytet mellan Skagerak och Östersjön"[1]). The result of the investigation is:— that the wave-front of the internal tidal water is the most important cause of the entire water circulation in the Transition Area and that the slight difference in pressure which exists between the surface water in the southern part of the Baltic and the northern part of the Kattegat is of but little significance.

The consequences of this investigation will be found embodied in:— O. Pettersson, "Vattencirkulationen i Norra Atlanten", Ymer 1931, H. 3 and 4.

The work at the Bornø Station and in the Kattegat has been directed towards observing the periodicity of the pulsations in the internal tidal waters; this is done partly through series of deep soundings at Bornø Station and partly by means of an automatic instrument (the "flottör") which registers the level alternations in the heavier layers of water in the Kattegat (limit for S ‰ 32 ‰) for lengthy periods. This instrument is constantly in position in the vicinity of the lightship "Fladen", in the middle of the Kattegat.

In this connection may be mentioned the co-operation of the Swedish Commission in the international investigation of the internal waves in the southern Kattegat in August 1931. This investigation was carried out under the leadership of Dr. Otterstedt on board the steamer "Skagerak". The results of this investigation are now under preparation.

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[1]) Svenska Hydrografisk-Biologiska Kommissionens Skrifter. Ny Serie. Hydrografi IX.

BALTIC AREA
1931.

By

K. A. Andersson.

In accordance with the discussions and recommendations at the meeting in the year 1931 the herring, the salmon and the flounder were the main objects of the investigations that year.

A report has been published by the Baltic Area Committee concerning the flounder with contributions from Denmark, Finland, Germany and Sweden. The results given in this report ought in regard to their practical importance for the fishery to be closely deliberated at the next meeting of the Committee.

Denmark.

Biology.

Danish research work was carried out in the latter half of the month of August from the "Japetus Steenstrup" in the waters to the east and north of Bornholm and round Christiansö.

Plaice and Flounder.

At Balka (East coast of Bornholm) fishing experiments with a hand push net were carried out on August 27th and 31st. On August 27th the hand push net on account of a heavy swell could only be used in the mouth of a little rivulet; per fishing unit (1 man in 1 hour) 241 flounders of the 0-group (mean length 2.99 cm.), but no plaice were caught. On the 31st of August, the sea being calm, the hand push net was used off the beach at a depth of $^1/_4$—1 m.; per fishing unit 1 plaice (4.0 cm.) of the 0-group and 338 flounders of the 0-group (mean length 3.01 cm.) were caught. In 1928 28 plaice of the 0-group were caught per fishing unit on the same spot. The hand push net fishing thus indicates that the 1931 year-class is rather poor. The fishing with Johansen's young plaice trawl and with the hand push net in August 1931 along the south coast of Bornholm yielded no plaice of the 0-group at all, and this too shows that the 1931 year-class was a poor one.

Valuation of the sea bottom.

To the East and North of Bornholm a series of bottom samples were made with Petersen's bottom sampler. *Macoma calcarea* constituted by far the largest amount

of the bottom invertebrates, next to it comes *Astarte borealis* and *Macoma baltica*. It was especially in the deeper part of the Bornholm Deep (75—100 m.) that *Macoma calcarea* predominated.

Plankton.

Vertical hauls with the Hensen Net were made in the waters East and North of Bornholm (as well as in the Arkona Basin) in order to investigate the amount of food available for the herring, in connection with experiments of their stomach contents. It is intended to continue these investigations in future.

Finland.

Biology.

Material for scale-analysis of salmon from the Tornio, Kemi, Oulu, Kymi and Kokemäki rivers was collected. Marking of young salmon in the Kokemäki river was carried out.

A paper on the herring in the east part of the Finnish Gulf has been published: Reino U. Kanerva: Viipurin rannikon hailikannoista, Suomen Kalatalous, vol. 11, pp. 87—107 or. Om strömmingsstammarna och -fisket vid viborgska kusten, Finlands Fiskerier, vol. 11, pp. 105—123.

Statistics of the seals killed in the Gulfs of Bothnia and Finland were collected.

Hydrography.

1) Regular observations were made as follows:—
   a) Surface temperature daily, surface salinity every 5th day, temperature and salinity at different depths every 10th day at 26 coast stations and 10 lightships.
   b) Surface temperature and salinity by liners from Finland to Denmark.
   c) Currents at three depths three times daily at 10 lightships.
   d) Registration of the sea-level at 16 stations and readings of the sea-level at 20 stations.
   e) Records of ice conditions in journals and sketch-maps at about 100 stations and by all Finnish ships in the Baltic.
2) A hydrographical cruise was made in July 1931 in the Baltic north of Gotland, during which 66 stations were made. On this cruise samples for the determination of chlorinity, oxygen, alkali reserve, nitrogen compounds (ammonia, nitrate) were collected. In addition determinations of hydrogen-ion-concentration and phosphate content were made on board.
3) A special cruise for current measurements and detailed hydrographical work was made in the Kattegat in August. On the way down similar work to that carried out on the cruise in July was made at 20 stations in the Baltic.

Germany.

The monthly control of the flat fishes landed in a series of Baltic harbours was continued in the year under review. A preliminary report will be published in "Mitteilungen des Deutschen Seefischerei-Vereins" Bd. XXXXVII, No. 11—12.

Investigations were carried out in order to ascertain the occurrence of 0- and I-groups of the plaice and flounder at the German coast.

From the two marking experiments on the common dab carried out during the previous year in the Middle Baltic 45 % and 25 % were recaptured and a report thereon will be prepared for publishing.

In order to ascertain the stock of young larvae of the autumn spawning herring a cruise was made in October (see the report of the Transition Area).

From the marking experiments on the brown trout, carried out during the previous year by Professor Henking in connection with the "Deutscher Seefischerei-Verein" 129 specimens were recaptured during the years 1930 and 1931. The experiment has given interesting results and Professor Henking will soon give a report thereon.

With support from the "Preussisches Ministerium für Landwirtschaft und Forsten" three cruises were made to the Middle Bank in order to investigate the stock of fish and the possibilities for fishery on the said bank. The results will be published in the "Zeitschrift für Fischerei", Berlin-Neudamm.

Latvia.

Statistics.

Statistical work was regularly continued by the Board of Fisheries and Pisciculture (Ministry of Agriculture), the Latvian seashore being divided into 73 statistical districts. Detailed data regarding the motor boats, comprehending the boats and the owners name, the measures of the boat, the type and horse power of the motor were recorded as in the past year.

Also statistics of the export of fish and fish products, e.g. preserves, were continued.

Statistics of the number and species of seals along the seashore were collected.

The data for 1930 are published in the seventh statistical year-book, edited by the Chief of the Board of Fisheries and Pisciculture Mr. V. Miezis: "Bulletin Statistique des Peches Maritimes de Lettonie — Année 1930". The statistical materials for 1931 are ready for publication.

Biology.

The experiments and investigations in the development and cultivation of Salmonids and Coregonids at the State Fish Hatchery at Tome and the Fishery Laboratory of the Ministry of Agriculture were continued. A special paper regarding the artificial propagation of Salmonids in Latvian waters was published by Mr. W. Mannsfeld: "Die Lachszucht in Lettland und die staatliche Brutanstalt in Tomsdorf" (Mitt. d. Deutschen Seefischerei-Vereins, 1931, Bd. XXXXVII, Nr. 2/3).

The special investigations of Salmonids with regard to their distribution, migration and spawning circumstances were continued at the Fishery Laboratory. The marking experiments of *Salmo salar* gave interesting results, one of the Salmons marked at the River Venta (Windau) being recaptured near Sundsvall (Sweden), another near Copenhagen (cfr. Mannsfeld: Mitt. d. Deutschen Seefischerei-Vereins, Bd. XXXXVII, Nr. 11—12, p. 481).

The researches carried out at the Fishery Laboratory in connection with the Commission for the Investigation of the Pollution of the River Daugava were continued.

Investigations of Pleuronectids, their rate of growth, distribution and migration were continued at the Fishery Laboratory (Ministry of Agriculture).

The Hydrobiological Station of the Latvian University (Director: Prof. Dr. Embrik Strand) continued its researches regarding the fish of the waters bordering the Latvian coast. Mention may be made of the interesting find of *Cottus bubalis* Euphr. in the Gulf of Riga in the summer of 1931. The Station began researches on the vertical distribution of *Clupea harengus* L. var. *membras* L., *Clupea sprattus* L. var. *baltica* Gui. Schn. and *Osmerus eperlanus* L. in the Gulf of Riga in order to find out the way in which this distribution depends upon the alternations at different hours of the temperature of the water, of the salinity and of the plankton. Planktonic researches in the waters bordering the Latvian coast and the working out the materials collected by the Commission for the Investigation of the Pollution of the River Daugava (Düna) were continued by the Station.

Hydrography.

By the Hydrobiological Station of the Latvian University surface observations of the sea regarding t° and S were regularly carried out approximately as in 1930 (cfr. Rapp. LXXIV, p. 198). Owing to the financial crisis, however, the number of observations is smaller than that of 1930; moreover much material was lost through the destruction in August 1931 of the ship "Balva" off Pernau. The observations were published in the "Bulletin Hydrographique" and in "Folia Zoologica et Hidrobiologica", Vol. III, Nr. 2, p. 250 sq. (1931).

The Marine Department (Ministry of Finance) continued the observations of water level along the seashore. The results of these observations for the year 1930 have been published in the "Bulletin hydrographique pour l'année 1930". A record, comprehending the hydrometrical observations in Latvian waters is published by Chief-engeneer P. Stakle: "Observations hydrométriques en Lettonie jusqu'au 31.X.1929". The published data beginning with the year 1865. Topographical measurements of the Latvian coast from Ainazi (Haynash) to Salacgriva (Salismünde) combined with measurements of the depth of the sea have been closed. A chart of the harbour of Liepaja (Libau) is published by the Department.

The State Meteorological Bureau (Ministry of Agriculture) continued its observations of surface temperatures of the sea and the observations of ice conditions from 8 and 11 stations respectively along the seashore as in former years (cfr. Rapp. LXXIV, p. 199).

Various Investigations.

The Fishery Laboratory continued the chemical and technical investigations regarding the content of iodine, fat etc. of fishes and fish preserves. Also the researches of the pollution of rivers by the cellulose industry and oil refineries were continued.

The works of the Commission for the Investigation of the Pollution of the River Daugava (Düna) were continued.

The Hydrobiological Station of the Latvian University has continued the researches mentioned in Rap. LXXIV, p. 199.

Poland.

During the last year the scientific bases for the exploration of the sea were reconstructed. The Marine Fisheries Laboratory at Hel and the Institute of the Fisheries-Economy at Bydgoszcz were amalgamated and a new Institute was formed under the name: Marine Station (Stacja Morska). This new Institute will serve for the marine fisheries investigations as well as for scientific researches and for practical courses for students. Meanwhile, before the Marine Station is completely organized, the scientific part remains at Hel and the part destined for the fisheries investigations is located in Gdynia, in the building of the Sea Fisheries Office.

In connection with the reconstruction of the institutes destined for the exploration of the sea and also with a general and necessary tendency to economise on all points, the researches were limited chiefly to the continuation of previous work.

Hydrography.

The mareographic station at the port of Gdynia has begun its work. An exact determination of the zero-point, for the purposes of the mareographic station was made. Three new water-gauges were placed in different parts of the polish shore.

Daily observations of the temperature of the sea water at five different depths, at one fixed point near Hel were made. Special attention was paid to the changes of the temperature of the water at different depths in connection with the changes of the atmospherical pressure and also of the direction of the winds. A direct concord between the movements of the water at greater depths and the direction of winds was stated. The results of those investigations will be published shortly and similar investigations will also be continued in other parts of the Baltic Sea.

The results of the investigations concerning the salinity of the Gulf of Danzig and the influence of the Vistula upon it, were published.

A new map of the Polish shore with bathymetrical indications was published.

Biological and Fisheries Investigations.

Samples of plankton were collected at different points of the Polish shore chiefly for the study of the Dinoflagellates.

Materials for the study of the Baltic herring were collected. Special attention was paid to the collecting of materials for the study of Alosa, uncommonly abundant during the past year.

Materials for the study of the effect of different fishing gear upon the stock of flat fishes were collected.

Studies upon the rate of growth and of the morphometrical features of the Baltic cod were begun.

Studies upon the rate of growth and upon the morphometrical features of different stocks of the salmon and of the sea trout were continued. The results of the first part of those studies were published in the Journal du Conseil, Vol. VI, 1931.

Marking experiments on young salmon and sea trout were continued.

Chemical composition of several species of the commercial fishes from the Polish shore was studied.

Studies upon the biology of *Glyptonotus entomon* were continued and will shortly be published.

Sweden.

The investigations were carried out mainly concerning the flounder, the salmon, the herring, the turbot, the cod, the plankton and the hydrography.

The research vessels.

Investigations at sea were made by the motorboat "Eystrasalt" and the research vessel "Skagerak". The Eystrasalt was kept in continuous commission for investigations in the Baltic from the beginning of June until the middle of November.

The research vessel Skagerak made three cruises to the Baltic, in February—March and October for biological investigations and in August—September for hydrographical work.

Flounder.

In February, March and October material was collected at many stations in the region between Bornholm and Sweden, especially for the study of the influence of the fishery upon the stock of flounder. The results of these studies are published in the general report on the Baltic flounder (Rapp. et Proc.-Verb., Vol. LXXVIII).

In June and November investigations were made of the shallow water near the southern Swedish coast in order to study the race of the flounder in these waters. The stock there was very poor and we did not succeed in obtaining sufficient material.

In the autumn a great deal of work was devoted to the study of the stock of the young stages. At Gotland and Öland, in the Kalmar Sound and in the Bornholm area many samples were collected. The catches of the 0-group were poorer than in the previous year.

Many samples from the commercial catches were measured.

Turbot.

In accordance with the programme marking experiments of the turbot were to be made in the southern part of the Baltic. We had the opportunity to mark only 101 specimens. These were put out off Simrishamn on the east coast of Scania during the period 5th—12th of June. Up to the 20th of September 57 specimens, 56.4 %, were recaptured. Most of these had made only short migrations, 1—16 km. Only one specimen, recaptured the 8th of September, had migrated 28.5 km.

Fishing experiments were made during August and September at the middle and southern Baltic coast of Sweden for collecting young stages of flat fish. The catches of the 0-group of the turbot were as a rule smaller than in the year 1930.

Plaice.

In the winter (the beginning of March) and the autumn (October) cruises were made to the southern Baltic for the study of the influence of the fishery upon the stock of plaice and for controlling the fisheries during the close time for this fish. It may be stated, that, as a rule, the plaice captured during the close time could be put out again quite uninjured.

Cod.

During recent years the cod fishery along the Swedish Baltic coast has been poor. The stock has obviously been very weak. During the year under review many fishing experiments were made. The catches were as a rule small, but in the area north of Bornholm a good deal of small cod of the 0- and I-groups, appeared in the catches during March and October.

Herring.

The herring investigations were carried out according to the same scheme as in the previous year. Many samples from different parts of the east and the south coast were studied as to races and age-composition. Through the courtesy of Director Miezis in Riga we have also obtained an interesting sample from the coast of Latvia.

The old year-class from 1924 can still be traced in the samples of autumn spawning herring, but it has now become very weak. There is still no predominant mature new year-group. In a few samples the two-years group from 1929 was strong.

The spring spawners formed a great proportion in the catches as in the two previous years. The year-group from 1925 was during 1931 very thinned out.

As there was no very rich year-class in 1931, the herring was very poor along nearly the whole of the Swedish coast. Only in the case of the year-group from 1929 being rich, can we expect any improvement in the herring fishery for the next year.

In two issues of "Ny Svensk Fiskeritidskrift", No. 3 1931 and No. 2 1932, Dr. Hessle has attempted predictions from these investigations regarding the herring-fishery and has so far been fairly successful.

During the cruises to the southern Baltic in March and October we tried to ascertain the distribution of herring during these months. In March the catches of very small

herring, 10 – 15 cm. in length, were rather good in deeper water to the north and to the east of Bornholm.

During September and October a great number of hauls with the 2-metres ring trawl were made at many stations on different parts of the east coast in order to ascertain the stock and distribution of young herring, but the catches were small.

Salmon and Sea Trout.

Scale samples were collected from different parts of the Baltic coast for studying the rate of growth and age-composition of the stock.

The methods for the capture of salmon and sea trout on the coast were studied and analyses of the catches were made.

The salmon fishery off the coast was in some places very rich. On the southern coast in shallow water the catches of undersized and large salmon were good in the spring.

A report on the investigations of the salmon is being prepared for publication by Dr. G. Alm.

Plankton.

The quantitative investigations of the zooplankton were continued at a number of stations in different parts of the Baltic and at different seasons. As the Mysids in the Baltic are of very great importance as food for the herring and other fishes stress has been laid upon the study of the stock and the distribution of these animals.

Hydrography.

In addition to current measurements with registering instruments carried out in the central part of the Kattegat during the previous year in order to study the vertical distribution of the surface wind current, the same kinds of measurements were made during August and September in the middle part of the Baltic between Gotland and the coast of Latvia. This portion was chosen as being very suitable for the purpose, as it has the same depth over a great area, about 140 metres, no discontinuity in the salinity and no considerable tidal phenomenon in deeper layers of water.

Three registering instruments for measuring deep-water were placed at different depths for a fortnight each during two periods. The depths where the registering instruments were placed were for each period 10, 20, 30 metres and 10, 20, 26 metres.

In connection with these measurements hydrographic observations and current measurements were carried out from the ship at anchor very near the same place.

For comparison with the hydrographic material collected continuous observations of the wind were carried out at the Hoborg lighthouse on the coast of Gotland.